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United States  
Department of  
Agriculture

Forest Service

Forest Health  
Technology  
Enterprise Team

Fort Collins,  
Colorado

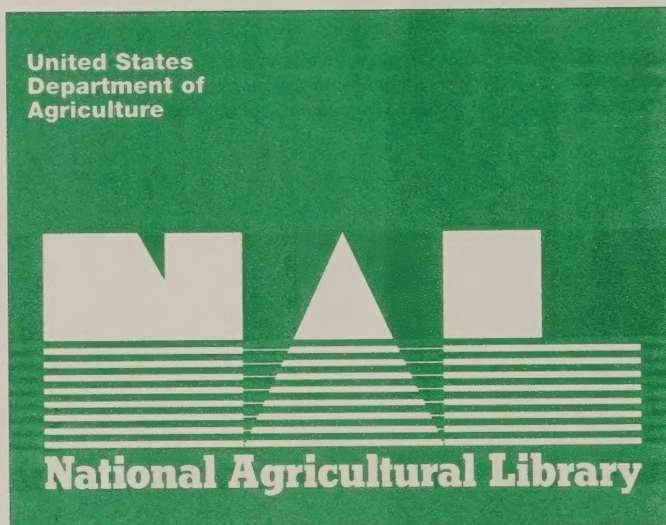
FHTET 96-28

November 1996



# Forest Health Technology Enterprise Team 1996 Accomplishment Report





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## **INTRODUCTION**

Our Nation's forests provide a multitude of resources that can contribute to the economic vitality of local and regional communities while providing clean air and water, wildlife habitat, scenic beauty, and recreational opportunities for millions of Americans. Ensuring ecosystem health, diversity and productivity is the top priority for the USDA Forest Service.

The Forest Service recently adopted a policy of ecosystem management which places a greater emphasis on the health of our nation's forests than ever before. The Forest Service plan, entitled "Healthy Forests for America's Future: A Strategic Plan," provides comprehensive guidelines and approaches to maintain and enhance the health of trees, forests and forested ecosystems. Technologies required for protecting the health of America's forests are identified in the strategic plan. The Forest Health Technology Enterprise Team (FHTET) was established to address these needs.

## **MISSION**

The mission of FHTET is to foster the development and use of technologies to protect and improve the health of America's forests.

## **VISION**

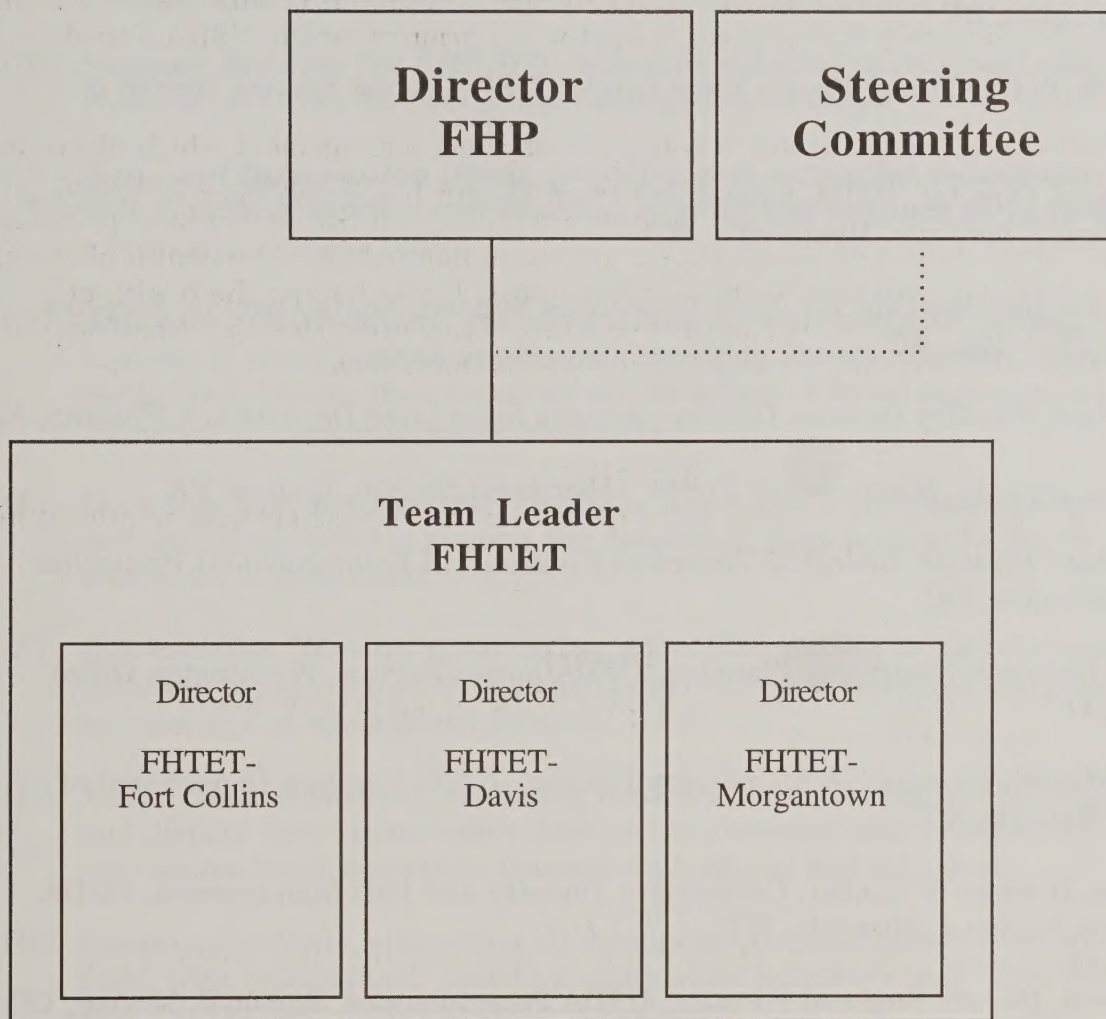
FHTET is the forest health technology provider of choice because we are:

- responsive to customer needs,
- competent, and
- cost-competitive.

## **GOALS**

- Forest health assessment technologies and information gathering, analysis and integration methods that are integral to forest ecosystem management are developed, evaluated, transferred to and used by land managers.
- Environmentally sound technologies and application methodologies to maintain or improve the health of America's forests are developed, improved, evaluated, transferred to and adopted by land managers.

## ORGANIZATION AND STAFFING





## **STEERING COMMITTEE**

Ann Bartuska, Director of Forest Health Protection, USDA Forest Service, Washington Office, Washington, DC

Bill Carothers, Acting Forest Health Team Leader, USDA Forest Service, Region 8, Atlanta, GA

Ernest Delfosse, Director, USDA Animal and Plant Health Inspection Service, National Biological Control Institute, Hyattsville, MD

Wray Freeman, Division Director, Field Operations Support, South Carolina Forestry Commission, Columbia, SC

T. Michael Hart, Forestry Division Director, Arizona State Land Department, Phoenix, AZ

Robert Lewis, Director, Northeastern Forest Experiment Station, Radnor, PA

Janet Andersen, Director, Biological Pesticides Division, US Environmental Protection Agency, Washington, DC

Christopher Risbrudt, Director of Planning, USDA Forest Service, Washington Office, Washington, DC

Howard Singletary, Director, Plant Industry Division, North Carolina Department of Agriculture, Raleigh, NC

David Spores, Director of Timber, Cooperative Forestry and Pest Management, USDA Forest Service, Region 1, Missoula, MT

Tom Thompson, Deputy Regional Forester, USDA Forest Service, Region 2, Denver, CO

John Walstad, Professor and Head, Department of Forest Resources, Oregon State University, Corvallis, OR



## FOCUS AREAS

- (A) **Management and Operations**, providing FHTET operations at Davis, CA; Morgantown, WV; and Ft. Collins, CO.
- (B) **Support Services for FHP-WO**, delivering information services to the FHP Washington Office for both annual and as-needed tasks.
- (C) **Data and Information Needs**, providing data acquisition technologies such as remote sensing systems and data management systems such as geographic information systems (GIS).
- (D) **Analysis and Modeling**, providing managers with analytical models and biometrics analysis of forest ecosystem processes involving insects, pathogens, and other disturbance factors that can translate the effects of forest management into responses in vegetation-based indicators.
- (E) **Decision Support Systems**, providing forest health information (data, knowledge, and analytical tools) to support the decision-making process for forest health ecosystem management.
- (F) **Information Display**, constructing affordable, flexible forest information display tools and to ensure that data visualization will be as available and useable in word processing and spreadsheet formats.
- (G) **Value Determination**, developing methods and technologies to identify, measure, and display forest ecosystem values and to systematically relate these values to alternative forest ecosystem management actions and outcomes.
- (H) **Communications**, supporting all management and administrative organizational tasks with publications, including information letters—Timely Tips, FHTET-Update, and FSCBG Technology Transfer newsletter.
- (I) **Decision Support Systems for Pest Control**, developing easy-to-use field decision support system based upon the FSCBG model for managing forest pests that recommends safety buffer zones and provides probability for and predictable levels of control and impact.
- (J) **Environmental Fate Studies**, developing the capability to predict and account for the fate of control agents spray (active and nonactive components) in the air, canopy, and ground following aerial application.
- (K) **Biopesticides**, developing methods and technologies for the use of biological agents for the immediate control of forest pests; and **Biological Controls**, developing methods and technologies for the use of natural enemies to maintain forest pests at acceptable thresholds over time.
- (L) **Nontarget Studies**, developing information on the effect of control agents on non-target species.



## **SUMMARY OF ACCOMPLISHMENTS FOR FY 1996**

### **A. Management and Operations:**

- Fully implemented FHTET leadership structure
- Conducted the first meeting of the FHTET Steering Committee on April 25-26, 1996, in Fort Collins, CO.
- Established teams—Communications and Marketing
- Developed procedures for review of Forest Health Protection (FHP) National Steering Committees
- Developed process for field input to FHP technology development programs and priorities
- Added Impacts and Pesticides Program Manager to FHTET-Morgantown staff

### **B. Support Services for FHP-WO:**

- Administered review of on-going projects and distribution of 1.2 million dollars for 23 field projects in FY96, with the express purpose of moving research findings into practical application and into forest health operations
- Reports of insect and disease occurrence and trends across the U.S. were collected, quality checked, and summarized for inclusion in 1995 Report of Insect and Disease Conditions
- Completed and delivered the Congressionally-mandated Pesticide Use Report for the 1995 Annual Report of the Forest Service
- Provided geographic information and analysis support for production of a national map and database of insect and disease risk and a map and database showing FHP activities on other Federal lands

### **C. Data and Information Needs:**

- Planned and conducted 17 remote sensing missions during the summer of 1996 in support to a variety of Forest Service units and other agencies nationwide
- Conducted training courses and provided technical support to FHP field units
- Updated the Airborne Video System Users Guide to include the new developments for automated mosaicking of video imagery

### **D. Analysis and Modelling**

- Conducted a meeting between representatives from British Columbia Ministry of Forests, Intermountain Research Station, WO Forest Management Service Center and Forest Health Technology Enterprise Team—Fort Collins to further understand the current roles of the individuals and their usage of the Forest Vegetation Simulator (FVS) and associated models
- Implemented a Bulletin Board System and anonymous File Transfer Protocol (FTP) site to allow model and information retrieval through modems and the Internet
- Completed the Western Root Disease User's Guide version 3.0, Detailed Model Description and Dwarf Mistletoe Training Package
- Coordinated training sessions for Regions 3, 4, and 5
- Database recorder and User's Guide were completed for Western Root Disease and Commandra Blister Rust



#### **D. Analysis and Modelling (continued)**

- Datasets and automated routines for Landscape Assessment were delivered to 2 Northern Region FH offices and staff were trained on usage
- A new release of the Pest Trend Impact Plot System (PTIPS) database, all applications, and updated documentation were completed
- Provided sensitivity analysis for annosus root disease portion of combined root disease model
- Cooperated with Forest Management, Timber Management Research, and Fire Research in the construction of a forest management module for the Forest Vegetation Simulator (FVS), based on the westwide pine beetle model

#### **E. Decision Support Systems**

- Beta version of Rulebase Toolkit was completed and is being implemented
- Poster display on natural resource rulebases earned a first place certificate at the SAF conference in Portland, Maine
- The INTeGrated FOrest Resource Management System (INFORMS), version 1.0 was built in 1 year and is in the process of being implemented on the 615 platform across many sites—perhaps the first major application available on the 615 platform
- INFORMS version 1.0 was demonstrated to numerous staffs and sites in every region of the Forest Service with expressed interest shown by audiences to adopting use of the software. Some staffs are committed to funding INFORMS implementation in FY97
- Work was initiated and cooperation established to integrate FVS within INFORMS
- FHTET partnered with the Gypsy Moth Expert System (GypsES) development team to conduct a thorough review of the development, maintenance, and support issues surrounding this software. A detailed review report will be released in early FY97.

#### **F. Information Display**

- Provided support in the evaluation, use, and application of remote sensing, image processing, data visualization, and Geographic Information Systems (GIS) technologies
- Provided support for SmartForest visualization software for the Technology Development Program (TDP)

#### **G. Value Determination**

- Initiated non-commodity valuation studies using Enterprise funding from Rocky Mountain and Pacific Southwest Research Stations

#### **H. Communications**

- Produced 10 issues of pesticide newsletter, 4 issues of FHTET “Update” letter, and 1 issue of Forest Service Cramer Barry Grim model (FSCBG) technology transfer letter

#### **I. Decision Support Systems for Pest Control**

- Produced the SpraySafe Manager Decision Support System (DSS) in cooperation with New Zealand
- Supported development of GypsES DSS in cooperation with Northeastern Area
- Formed a partnership with U.S. Army, Department of Energy, and National Weather Service to produce draft of a field meteorology handbook for aerial spraying and prescribed burning

## **J. Environmental Fate Studies**

- Published and presented data on the fate of *Bt* observed during the Utah gypsy moth eradication program

## **K. Biopesticides and Biological Controls:**

### *Biopesticides*

- Publication containing lists, description of uses, and priorities for development of semiochemicals of forest and shade tree insect pests in North America
- Draft compliance agreement for management of pine shoot beetle
- Field evaluation of 4-AA for protection of individual and small clusters of trees from southern pine beetle attacks
- Publication of a handbook of common caterpillars of western forests
- Initiated a partnership with ARS to develop QA/QC procedures for manufacture of semiochemicals for use in monitoring forest and shade tree insects
- Development of an atmospheric primer for aerial spraying of forests
- Pheromone flakes shown to be effective in disrupting mating of gypsy moths

### *Biological Controls*

- Publication containing a review of the literature and identification of future opportunities for biological control of arthropod pests of the Northeastern and North Central forests in the United States
- Importation of a parasite from Australia into Brazil for rearing and release for control of a woodwasp
- Release and establishment of an exotic predator into several sites in Connecticut for control of the hemlock woolly adelgid
- Initiated a partnership with Utah State University to develop a process to use a fungal rust spore for control of exotic weed dyer's woad
- Initiated a search in China for natural enemies of the exotic pest, mile-a-minute weed

## **L. Non-Target Studies**

- Studied the long-term impacts of selected insecticides and defoliation on selected nontarget terrestrial arthropods, salamanders, and birds associated with broadleaved forests
- Developed a database on documented nontarget impacts of biological insecticides on forest ecosystems
- Publication of the impacts of diflubenzuron on non-target organisms in broadleaved watersheds in the northeast
- Publication of effects of *Bt* and gypsy moth defoliation on native arthropods of West Virginia



## **PROJECT ACCOMPLISHMENTS**

## **Focus Area A: Management and Operations**

### **Project A1: Implement the concept and principles of the Forest Health Technology Enterprise Team (FHTET)**

**Project Leader:** Bov Eav

**Objectives:** To fully implement the concept and principles of the Forest Health Technology Enterprise Team

**Cooperators:** WO FHP Staff and FHP Regional Directors

#### **Accomplishments:**

The highlights of FY96 accomplishments include the successful FHTET Steering Committee meeting held in April 1996 in Fort Collins, CO, and the smooth functioning of FHTET.

On April 25-26, 1996, the FHTET Steering Committee held its first meeting in Fort Collins, CO. The committee reviewed and adopted its role which is "to provide guidance to the Enterprise Team, provides course corrections, and provides a broad base of direction for the program of the Enterprise Team." The committee also reviewed and approved the mission and vision statements for FHTET. Several suggestions were made by committee members regarding the goal statements and operating guidelines. FHTET leadership is implementing the recommendations in the preparation of a strategic plan for the team.

#### **Funding:**

Source(s):

FHP (Salaries and Operations)

Expenditure(s):

Salaries and Operations

#### **Final Product and Completion Date:**

- FHTET FY96 Program of Work: February 1996
- FHTET Strategic Plan: December 1996
- FHTET Capability Document: December 1996
- Steering Committee Meeting: April 1996
- FHTET Administrative Review: January 1997



## **Project A2: Ensure the Effective and Efficient Operation of FHTET-Fort Collins**

**Project Leader:** Bov Eav

**Objectives:** To ensure the effective and efficient operation of FHTET-FC

### **Accomplishments:**

Through teamwork of the entire Enterprise Team and in cooperation with FHP WO and field staff, over 95% of projects in FHTET-FC Fiscal Year 1996 Program of Work were completed.

Personnel of all three Enterprise Team centers joined to review accomplishments and lessons learned and to formulate a coordinated Fiscal Year 1997 Program of Work. Technology needs and priorities were identified by national steering committees representing Regions and Area offices and State cooperators were incorporated into the program of work.

### **Funding:**

Source(s):

FHP (Salaries and Operations)

Expenditure(s):

Salaries and Operations

### **Final Product and Completion Date:**

- FHTET-FC Accomplishment Report for FY96: April 1996
- FHTET-FC input to FY96 FHTET Program of Work: February 1996
- FHTET-FC input to FY97 Program of Work: October 1996

## **Project A3: FHTET-Morgantown Operations**

**Project Leader:** Allan Bullard

**Objectives:** Define and maintain scope and operations at FHTET-Morgantown

### **Accomplishments:**

Emphasis for FY96 was placed on the establishment of the Forest Health Technology Enterprise Team and FHTET-Morgantown as accepted and viable functions within Forest Health Protection. The FY96 FHTET Program of Work (POW) was provided to all Regions and the Area; FHP unit directors were contacted and the FY96 POW was discussed; an Issue Paper was prepared (defining the role of FHTET in the technology development process); and visits were made to R-5, R-6, R-10, and NA to discuss FHTET and FHTET-Morgantown, their roles and responsibilities, and how FHTET fits into the functioning of FHP at the national level were discussed.

Visits were also made to the Missoula Technology Development Center (MTDC) and the Centre for Agriculture and Biosciences, Inc (CABI) in London, England, the International Institute for Biological Control (IIBC) in London and the IIBC Laboratory in Delmont, Switzerland to discuss potential future opportunities for cooperation and collaboration between these units and FHTET/FHTET-Morgantown.

These visits resulted in the establishment of several new projects for FHTET-Morgantown with R-6 and NA/NC as cooperators and the identification of several possible joint ventures of mutual interest between CABI, IIBC, and FHTET. Other major accomplishments included: the arrangement of a detail of Gary Smith (R-6 Pesticide Coordinator) to Morgantown to coordinate the FS NAPIAP program for FY96 and to work with the FHTET-Morgantown Impacts and Pesticides Program Manager (Jack Stein); Jack's detail to EPA to become familiar with EPA to facilitate registration and reregistration of pesticides of interest to the Forest Service; negotiation of an agreement for NE/NA to provide Morgantown administrative support during FY97; and the transfer of all Morgantown positions from NA to WO.

### **Funding:**

Source(s):

FHP (Salaries and Operations)

Expenditure(s):

Salaries and Operations

### **Final Product and Completion Date:**

- 1995 Accomplishment Report: January 1996
- FHTET 1996 POW: March 1996
- FHTET Strategic Plan: September 1996
- FHTET Draft 1997 POW: September 1996
- 1996 Accomplishment Report: November 1996
- FHTET-Davis functions incorporated into FHTET-Morgantown's plans: June 1996



## **Project A4: FHTET-Davis Operations**

**Project Leader:** Jack Barry

**Objectives:** To define and maintain scope and operations at FHTET-Davis.

### **Accomplishments:**

We prepared to close the FHTET-Davis office, scheduled for 1 January 1997. FHTET-Davis activities included team management, coupled with continuing projects, marketing and initiating new projects, addressing backlogs of reports and managing a major technology development contract. An office closure plan was drafted and sent in August to Director, FHP and FHTET management team. All property inventories have been checked and accountable property has been transferred to Pat Skyler. Other items will be transferred to R-5, PSW, MTDC, and the University of California as determined by need and economics of shipping. Emphasis during FY96 was placed on reporting, publishing, or otherwise ensuring that data and technology findings are passed on to MTDC or FHTET-Ft. Collins and Morgantown. Book Library has been sorted and several books sent to Ft. Collins. The inventory of frequently requested FPM, FHP, and FHTET reports will be sent to Ft. Collins. We have worked closely with the libraries at the University of California (Davis) and Intermountain Station to insure that all of our publications are available at these libraries.

The Davis office closure plan also contains the transfer of FSCBG model management. Bov Eav will be the COR on the contract and will handle FSCBG extended DSS. Harold Thistle will coordinate the FSCBG user group and provide technical consultation to Bov as requested. A report has been published in The Status of FSCBG and Related Documents—A 1996 Update (FHTET 96-17) that reviews current status of FSCBG and its relationship to other models and DSS that have evolved from FSCBG.

### **Funding:**

Source(s):

FHP (Salaries and Operations)

Expenditure(s):

Salaries and Operations

### **Final Product and Completion Date:**

- FHTET 1996 POW: March 1996
- Plan to close FHTET-Davis Office/Operations: August 1996
- Plan to transfer management of FSCBG Model: August 1996
- FHTET Strategic Plan: September 1996
- FHTET 1997 POW: September 1996
- FY95 Accomplishment Report: September 1995
- FY96 Accomplishment Report: November 1996
- Closure FHTET-Davis/Office/Operations: January 1, 1997

## **Project A5: Project 615 Implementation**

**Project Leader:** Dave Roschke

**Objectives:** To (1) coordinate, in cooperation with Washington Office Detached (WOD) units and Rocky Mountain Forest and Range Experiment Station (RMS), Project 615 implementation during the Project 615 Pilot Year; to (2) assess existing capabilities to access IBM equipment and the need for purchasing additional Project 615 contract capabilities to support the Forest Health Technology Enterprise Team-Fort Collins (FHTET-FC) personnel and projects; and to (3) provide support for workstation connectivity.

**Cooperators:**

Washington Office detached units  
USDA Forest Service  
Fort Collins, CO

Rocky Mountain Station Computer Systems  
USDA Forest Service  
Fort Collins, CO

**Accomplishments:**

The long-term contract with IBM for new computing systems with a fully networked UNIX-based client/server architecture is being implemented. Extensive coordination and planning for purchase, configuration, site preparation, deployment of equipment, and ongoing support for these systems were pursued between FHTET, RMS, and the other detached units. Details of system support from RMS were negotiated in order to efficiently service FHTET's needs. A framework for Oracle DBA access was negotiated and agreed to by RMS and the other detached units.

Two workstations and one X-terminal were received and deployed. Seven more X-terminals were ordered and will be received in the first quarter of FY 97.

Non-contract X-terminals were tested. These X-terminals are minimally compatible with the IBM system; however they do not support the high resolution necessary to take full advantage of the IBM GUI. Some have been targeted for replacement by new X-terminals; others should be replaced over the next few years. X server software was tested on both PC and Mac platforms and has been found to provide acceptable access to the IBM systems. Where appropriate, many of these systems have been equipped with X server software to provide access for staff members. Large monitors and graphics cards capable of supporting the high resolutions and the IBM GUI were purchased to enhance the graphical capabilities of several of the PCs and Macintoshes.

FHTET worked closely with the RMS computer systems and other detached unit staffs to arrange for local training. Classes that had been scheduled to occur in Boulder were rescheduled for Fort Collins because of the number of users and the nature of the work done here. By the end of the fiscal year, all of the FHTET staff had the opportunity to receive the introductory classes and attend the developer series in Fort Collins at no cost to FHTET. Most of the staff attended the introductory class and several attended one or more of the developers' classes.

**Funding:**

Source(s):

56,600 FHTET

Expenditure(s):

36,900 Computer-related expenses

19,700 Maintenance, FOR

**Final Product and Completion Date:**

- Initial deployment and pilot year testing: September 1996.
- System support: Ongoing



## **Project A6: Computer System Support**

**Project Leader:** Dave Roschke

**Objectives:** To provide systems support for FHTET-FC computer equipment and local area network (LAN), including maintaining PCs, Macintoshes, workstations, IBM/Project 615 equipment, printers, backups, and hardware and software tracking, purchasing, and updating.

**Cooperators:**

None

**Accomplishments:**

FHTET-FC works with a broad range of customers and cooperators on a variety of projects that have a correspondingly highly varied and complex set of objectives and requirements. Most projects are computer-oriented and frequently a combination of computing systems, platforms, and peripherals are required to effectively accomplish a project's objectives. In this environment compatibility, interconnectivity, and overall interoperability between systems and platforms is critical. The addition of the new contract IBM equipment and its associated Distributed Computing Environment have made the overall system even more complex and interoperability even more difficult to achieve. Significant project team members' time was frequently taken up with what were essentially system administration and support efforts.

A new contract employee was hired late in the second quarter to focus on computer system support. Since that time, significant progress has been made in increasing the efficiency and reliability of FHTET's computing environment. The burden for solving problems, performing or arranging and pursuing maintenance and repairs, working with vendors, and installing, configuring and tracking new and existing hardware and software has been focused within the computer systems support team, which has greatly increased the effectiveness of the rest of the FHTET-FC staff by allowing them to focus more on project work rather than problems with the computing systems and tools used for the projects.

**Fundings:**

Source(s):

24,300 FHTET

Expenditure(s):

22,800 Computer-related expenses  
1,500 Travel, training, and other

**Final Product and Completion Date:**

• Operable systems: Ongoing

## Focus Area B: Support Services for FHP-WO

### Project B1: Administer Technology Development Program (TDP)

**Project Leader:** Patrice Janiga

**Objectives:** To administer the Technology Development Program by facilitating identification of needs, monitoring progress, and distributing funds from the FHP Directorate.

#### Cooperators:

##### *Region and Area Forest Health Protection Directors*

William W. Boettcher Director Forest Pest Management Missoula, MT	Robert D. Averill Group Leader Forest Health Management Denver, CO	Milo Larson Director Forestry Albuquerque, NM
Dave Baumgartner Acting Director Forest Pest Management Ogden, UT	John A. Neisess Program Leader Forest Pest Management San Francisco, CA	Max. M. Ollieu Group Leader Forest Insects & Diseases Portland, OR
William A. Carothers Director Forest Health Atlanta, GA	Jerry Boughton Program Leader Forest Health Management Anchorage, AK	Gerard D. Hertel Director Forest Health Protection Radnor, PA

##### *Washington Office, Forest Health Protection Staff*

Ann Bartuska WO-FHP Director Washington, DC	Mel Weiss WO-FHP Deputy Director Washington, DC	Linda Jones WO-FHP Budget Analyst Washington, DC
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#### Accomplishments:

TDP distributed 1.2 million dollars over 23 projects in FY96. These projects ranged in funding from \$0 to \$275,355 with the express purpose of moving research findings into practical application and into forest health operations. Some of the projects currently involved in TDP are:

- Spatial analysis of root disease hazard
- Development of software toolkit for construction of rulebases
- Development of forest visualization software
- Modeling of chemical dispersions in forested environment
- Adaptation of Mountain Pine Beetle risk rating
- Pest impact trend permanent plot measurement & data management
- Monitoring of cone and seed insects' impacts on high elevation ecosystems
- Evaluation of efficacy of silvicultural treatments in prevention of root disease insect vectors
- Alternatives to Methyl bromide for control of nursery pests
- Semiochemical prevention of Ips
- Assessment of behavioral chemicals for suppression of southern pine beetle

Additionally, convened chairpersons of Technology Development chairpersons in order to identify opportunities and methods for improving the program, the technologies, and the sharing of information gained through the program. Collected, organized, and compiled reports of continuing and completed projects from Regions and the Area. Adjusted review criteria used by the review team to more clearly apply to assessment of continuing projects and requests for funding. Compiled review team findings and distributed among team members in order to facilitate discussion and interaction. The team deliberated the disposition of project funding and formed recommendations. Funding for projects has been distributed to regions as per the recommendations of the review panel.

#### **Fundings:**

Source(s):		Expenditure(s):	
2,000	FHTET	1,200,000	Disbursed to Regions
1,200,000	WO-FHP	1,500	Contract
		500	Computer-related expenses

#### **Final Product and Completion Date:**

- Distribution of funding to project team accomplished: February 1996
- Coordination of steering committees conducted: October 1995 and April 1996
- Revision and distribution of letter requesting new proposals and project reports for fiscal year: September 1996
- Compilation of completed project reports for fiscal years 1992-1995: August 1996



**Project B2: Support WO production of the Insect and Disease Conditions Report by providing data management services**

**Project Leader:** Patrice Janiga

**Objectives:** To (1) collect data on major insect and disease pests throughout the United States in order to synthesize summaries of pest occurrence and impacts on forest resources; to (2) review data provided by Regions and Area for accuracy compared to reports from prior years and feasible deviations in levels of occurrence; and to (3) summarize data into tabular reports for review by subject matter expert in WO-FHP office, Dick Fowler, for ultimate inclusion in an annual report, titled “Insect and Disease Occurrence in the United States in 1995.”

**Cooperators:**  
Dick Fowler  
Forest Health Protection  
Washington, DC

**Accomplishments:**  
The data collection and analysis conducted through this project is the only nationwide system for storing, retaining, and monitoring trends of major insects and diseases. The process provides both quality assurance for data used in a national report required by law and serves as a monitoring mechanism for occurrence trends over many years. This monitoring of longterm broad-based data provides a high level perspective not available through any other forestry program in the U.S.

Reports of insect and disease occurrence and trends across the U.S. were collected by Dick Fowler in the FHP-WO. The reports were screened for consistency with requested form of data. Data was entered into the Forest Pest Information System, FPIS, database. Comparisons were conducted against prior years data and deviations from data provided over the previous five years. Report summarizing occurrence data were provided to Dick Fowler for inclusion in annual report.

<b>Fundings:</b>		<b>Expenditure(s):</b>	
Source(s):			
3,600	FHTET	3,600	Contract

- Final Product and Completion Date:**
- Data sent from Regions to WO: February to April 1996
  - Map generation by Dick Fowler and Ed Yockey: July 1996
  - Data entry by Sally Scrivner: May 1996
  - Database updates programmed by Patrice Janiga: May 1996
  - Summary tables for report by Patrice Janiga: June 1996
  - Report submitted to PAO by Dick Fowler: August 1996
  - Revision of request letter for information coordinated between Dick Fowler and Ross Pywell: September 1996

## **Project B3: Production and hosting of Forest Health Exhibit**

**Project Leader:** Patrice Janiga

**Objectives:** To produce exhibit which reflects and supports objectives and key messages of the national forest health communications plan.

### **Cooperators:**

Joe Lewis	Linda Feldman	Marion Lostrom
Forest Health Protection	Public Affairs Office	Public Affairs Office
Washington, DC	Washington, DC	Washington, DC

### **Accomplishments:**

FHTET organized and coordinated design of the Forest Health Exhibit. Patrice Janiga, Joe Lewis, and Linda Feldman developed display specifications with emphasis on fulfilling objectives and communicating key messages of the Forest Health Communications Plan. PAO representative Marion Lostrom initiated coordination with the USDA Design Center in Washington. The USDA Design Center completed full design layout and production. Review and approval of mock-ups was coordinated by Patrice Janiga. FHTET designed fact sheets focusing on 3 primary issues: Fire adapted ecosystems, Urban/wildland interface, and Exotic pests. These fact sheets were based on text provided by Joe Lewis and research/review of relevant publications produced by the Forest Service and the American Forestry Association. Photographs and slides reflecting many aspects of these issues were collected from diverse agency sources. The display was hosted at the Society of American Foresters annual convention and the 7th American Forest Congress.

### **Funding:**

Source(s):	Expenditure(s):
20,200 FHTET	17,700 Contract
	2,500 Travel, training, and other

### **Final Product and Completion Date:**

- Exhibit completed: October 1996
- Exhibit hosted: October 1996 and November 1996
- Exhibit promotion with regions initiated: August 1996
- Preliminary scheduling of exhibit commitments for FY 1997 initiated: September 1996

## **Project B4: Western Forest Health Initiative Data Management**

**Project Leader:** Patrice Janiga

**Objectives:** To collect, document, and communicate information regarding all Western Forest Health Initiative projects.

### **Cooperators:**

#### *Western Region Forest Health Coordinators*

Ed Monnig Forest Pest Management Missoula, MT	Robert D. Averill Forest Health Management Denver, CO	Douglas Parker Forestry Albuquerque, NM
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Jack Amundson Timber Management Ogden, UT	John A. Neisess Forest Pest Management San Francisco, CA	Jerry Jensen Timber Management San Francisco, CA
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Susan Sater Forest Health Portland, OR	Jerry Boughton Forest Health Management Anchorage, AK
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#### *Washington Office, Forest Health Protection Staff*

Ann Bartuska WO-FHP Director Washington, DC	Mel Weiss WO-FHP Deputy Director Washington, DC	Linda Jones WO-FHP Budget Analyst Washington, DC
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Dick Fowler WO-FHP Washington, DC	Martha Merrill Detailer, WO-FHP Fort Collins, CO	Bruce Hostetler Detailer, WO-FHP Washington, DC
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### **Accomplishments:**

The Western Forest Health Initiative (WFHI) includes the development and monitoring of 40 recommendations, 335 projects on National Forests, and 9 projects being undertaken by States. The actions undertaken through the Initiative and the monitoring of their progress have provided, and continue to provide, important insights and information needed in order to continue the process of restoring the health of our forest ecosystems throughout the West and serve the nation by setting in motion important strategies for addressing forest health nationwide.

After intensive scoping and analysis, the Forest Service has formulated 40 recommendations calling for restructuring of current procedures that may prevent timely and effective response to forest health problems. The recommendations address Strategic objectives, Communications and Coordination, Budget, Policy, and Law. The Forest Service readily responded to forest health problems by designing and conducting innovative and efficient projects which ensure the sustained production of the goods and service that the public demands of its forests. Projects included in the Initiative provide three primary benefits. These benefits are: (1) reduce hazard of catastrophic loss of ecosystem structure or processes, (2) restore or substitute for key ecological processes, and (3) restore stressed sites. In 1994, 335 projects met criteria for inclusion in the Initiative. In 1996, 9 additional projects being conducted by states were added to the WFHI.



64 projects were completed in fiscal year 1995, 248 projects are expected to continue with completion dates extending from fiscal year 1996 through the year 2000.

FHTET drafted a request letter to the Regional Foresters with forms used by National Forests updating major aspects of the status of projects, reasons for delays (when applicable), and accurate reports of final costs and accomplishments for completed projects. Status reports of Western Forest Health Projects were collected from the western regions. The report information was entered into the Western Forest Health Initiative database. Washington Office staff, Dick Fowler and Mel Weiss, authored status statements for recommendations of the WFHI. FHTET completed drafting of the report, Western Forest Health Initiative: Status for Fiscal Year 1995. The report was provided to WO-FHP for final production by WO-PAO with a target distribution date of April 1996.

Throughout the year requests for briefing materials were submitted to FHTET from the WO-FHP office. These materials conveyed information in response to ad hoc questions posed to WO-FHP by Congressional staff and members of the public. FHTET executed queries, reviewed findings and presented requested information to WO-FHP often within 48 hours of the initial inquiry to FHTET.

**Funding:**

Source(s):		Expenditure(s):	
21,400	FHTET	22,500	Contract
1,100	WO-FHP		

**Final Product and Completion Date:**

- Data entered into database: November 1995
- Data quality check and validation: January 1996
- Data analysis and report drafting: January-March 1996
- Fiscal Year 1995 Status Report: March 1996
- Summary of area estimates by activities (ad hoc report): July 1996
- Request forms and letter for FY 1996 status reporting: September 1996

## **Project B5: NAPIAP Database Support and TDP Database Evaluation**

**Project Leader:** Judy Adams

**Objectives:** To (1) receive and input data that have been collected by Morgantown into the database; to (2) support and maintain the database; and (3) to improve the ease-of-use and functionality of the database, interface, and database query capabilities.

**Cooperators:**

Dick Reardon	Gary Smith
FHTET-Morgantown	FHTET-WO
Morgantown, WV	Washington, DC

**Accomplishments:**

Support and maintain the current database by providing assistance to Gary Smith, the administrator of the database. Enter data that is collected on an annual basis by Morgantown.

Since the current database is in an outdated mode of SQL\*FORMS, we reviewed the various options to bring it up-to-date. Those discussed included: 1) bringing the current database to a new version of SQL\*FORMS, 2) look at other databases that have already been developed that may meet the needs of NAPIAP and TDP, 3) design and develop a new database specifically for these two projects.

**Fundings:**

Source(s):	Expenditure(s):
6,500 FHTET	6,500 Contract

**Final Product and Completion Date:**

- Investigate NAPIAP database and difficulties associated with updating it to a current level: September 1996
- Preview the Financial Management and Information System developed from the Northeast Research Station: September 1996

## **Project B6: Pesticide Use Database Support and Report**

**Project Leader:** Dave Roschke

**Objectives:** To (1) collect and manage pesticide use information from Regions, Stations, and the Northeast Area and (2) to prepare the Pesticide Use Report for inclusion in Annual Report of the Forest Service.

**Cooperators:**

Paul Mistretta	Dave Thomas
USDA Forest Service	USDA Forest Service, FHP
Region 8	Washington Office

**Accomplishments:**

FHTET-FC completed and delivered the Congressionally-mandated Pesticide Use Report for the 1995 Annual Report of the Forest Service to WO-FHP for final review and publication. The call letter for the 1996 report was prepared at FHTET-FC and sent out in September, 1996 under the Director's signature. Arrangements were made to transfer the responsibility for completing the Annual Report to FHTET-FC, including the responsibility for oversight, final approval, and verification of data received from R/S/A. Arrangements have been made to continue working with Paul Mistretta, Pesticide Coordinator in R-8, for pesticide-related subject matter expertise and data verification for the 1996 report.

Communications for coordination of pesticide and biological control reporting and tracking were opened with the WO Range group in Fort Collins, which has interests and responsibilities similar to FHTET's in this area.

**Funding:**

Source(s):	Expenditure(s):
500 FHTET	500 Computer-related expenses

**Final Product and Completion Date:**

- Annual Pesticide Use Report: January 96
- Annual Call Letter: September 96



## **Project B7: FHP-WO Support for National Reporting Requirements**

**Project Leader:** Ross Pywell

**Objectives:** To provide GIS data base development and data management support to the FHP-WO to meet national reporting requirements on forest health conditions and trends.

### **Cooperators:**

Ann Bartuska  
FHP  
Washington, DC

Joe Lewis  
FHP  
Washington, DC

Mel Weiss  
FHP  
Washington, DC

Henry Lachowski  
RSAC  
Salt Lake City, UT

Leon LaMadeleine  
FHP-R4  
Ogden, UT

Dwane Van Hooser  
INT-FIA  
Ogden, UT

Ken Gibson  
FHP-R1  
Missoula, MT

Susan Johnson  
FHP-R2  
Denver, CO

Jill Wilson  
FHP-R3  
Flagstaff, AZ

Julie Weatherby  
FHP-R4  
Boise, ID

Lisa Levien  
FHP-R5  
Sacramento, CA

Julie Johnson  
FHP-R6  
Portland, OR

Dan Brown  
FHP-R8  
Atlanta, GA

Kathy Matthews  
FHP-R10  
Anchorage, AK

Russ McKinney  
FHP-R9  
Milwaukee, WI

Noel Schneeberger  
FHP-NA  
Radnor, PA

Bob Loomis  
FHM  
RTP, NC

Dick Halsey  
FHP-R4  
Boise, ID

### **Accomplishments:**

Support was provided to the Forest Health Assessment Team in the development of a national map and database of insect and disease risk to the Director in the development of a map and database showing FHP activities on other Federal lands, and to the Forest Health Monitoring Program in the organization of a national database and evaluation of off-plot data collection methods. A final version of the map was produced in several formats and sent to the Washington Office. The Director has decided to update the database annually, with map revisions made as needed.

The insect and disease national risk map for the Washington Office Forest Health Assessment Team is being developed but is behind schedule. Maps or data have been received from all Regions/Area. A contract for digitizing was developed and digitizing of the maps received to date has been completed and a GIS data base constructed. A meeting with Joe Lewis and FHTET staff was held to review the data. Based on that review, Northeastern Area was asked to consider revising their data. Once this is completed, the data base will be updated and a meeting held with all Regional representatives to review the final product.

Developing the database of 1995 aerial survey data for all Regions is underway. Digitized aerial survey data has been received from Regions 1, 3, 4, 5, 6, 10, and part of NA and loaded into an Arc/Info database at FHTETFC. Region 2 reinstituted an aerial survey program in 1995, but only limited areas were flown. The data is in hardcopy map form and will be digitized as time permits. Work on a report comparing methods, data collection methods, data attributes and data storage is underway. The report will be presented at the FHM coordination meeting in January 1997.

A pilot project to determine the feasibility and utility of combining other data sets with aerial survey data for the purpose of answering some of the "so what" questions was initiated on the Fish Lake and Dixie National Forests in Utah. This is a cooperative project between FHTET, Region 4 Forest Health, and INT-FIA. Aerial survey data back to the 1960's, land cover data from the GAP Analysis, and FIA plot locations and data have been pulled together into a single GIS data base. The intent is to try to use other available data sources to quantify losses to insect and disease beyond just number of acres or number of trees.

**Funding:**

Source(s):		Expenditure(s):	
59,900	FHTET	36,000	Contract
		2,400	Computer-related expenses
		1,000	Travel, training, and other
		19,500	RSAC

**Final Product and Completion Date:**

- Map of FHP activities on other federal lands: December 1995
- I&D national risk map: November 1996
- Database for all Regions of 1995 data: October 1996
- Report on inter-Regional differences and recommended standards for 1996: December 1996
- Procedures for producing data for WO reporting requirements: December 1996

## **Project B8: DFTM Trap Manufacture & Distribution**

**Project Leader:** Sally Scrivner

**Objectives:** To coordinate the manufacture and distribution of pheromone traps to western Regions and State cooperators in support of the Douglas-fir tussock moth early warning detection system.

### **Cooperators:**

USDA FS, R-1	USDA FS, R-2	USDA FS, R-3
Sandy Kegley	Bill Schaupp	Jill Wilson
Coeur d'Alene, ID	Golden, CO	Flagstaff, AZ

USDA FS, R-4	USDA FS, R-5	USDA FS, R-6
Julie Weatherby	John Wenz	Suzanne Wiley
Boise, ID	Sonora, CA	Portland, OR

### **Accomplishments:**

Negotiated satisfactorily with Foothills Gateway Rehabilitation Center in Fort Collins, Colorado, in order to have them improve their quality control methods and to produce a better trap this year. Using a rehabilitation center to manufacture the traps contributes in many ways to the well being of impaired individuals and the community at large by providing jobs for this nonprofit center and its workforce.

### **Funding:**

Source(s):	Expenditure(s):
15,000 FHTET	15,000 Contract

### **Final Product and Completion Date:**

- 7500 traps sent to the field: June, 1996



## Focus Area C: Data and Information Needs

### Project C1: Remote Sensing Support for Acquisition of Imagery

**Project Leader:** Dick Myhre

**Objectives:** To provide services and support to the field for acquisition of remotely sensed data in support of forest health monitoring and other resources activities.

**Cooperators:**

Tom Landon  
R-2/Aviation Management  
Denver, CO

Bill Snyder  
R-2/Photo Pilot  
Denver, CO

Vicki Dixon  
R-2/Fiscal  
Denver, CO

Budget/Fiscal Staff  
Rocky Mt. Station  
Fort Collins, CO

*Liaison & Special Project staff*  
Remote Sensing Applications Center  
Salt Lake City, UT

**Accomplishments:**

This service/support activity is operated on a cost reimbursable basis by the Remote Sensing Service Team (RSST) within FHTET/Ft. Collins. RSST worked with customers/users requesting support to determine their needs, provide remote sensing consultation, and design an airborne mission plan for acquisition of aerial photography or airborne videography. This program provided a total service package which included mission cost estimation and planning, preparation of flight maps, acquisition of imagery, purchasing and processing of film, and the delivery of end products.

Seventeen remote sensing missions were flown during the summer of 1996 for a variety of Forest Service units (FHP field units, Regional Office, National Forests, Ranger Districts, and Research), plus other agencies (Bureau of Indian Affairs and Natural Resources Conservation Service).

The Remote Sensing Applications Center (RSAC) in Salt Lake City provided technical assistance and support to FHTET-Fort Collins and FHP field units during the year. The Liaison and Special Project staff provided consultation, photo interpretation support, and assistance with image analysis.

**Funding:**

Source(s):

10,000	FHP to FHTET
21,000	FHP to RSAC
95,600	Enterprise funds

received from customers

Expenditure(s):

10,000	Equipment, maintenance, supplies
21,000	RSAC
95,600	Contract

**Final Product and Completion Date:**

- All remote sensing missions completed: September 1996
- Photo/video products delivered to customers: October 1996

## **Project C2: Remote Sensing Technologies Training**

**Project Leader:** Dick Myhre

**Objectives:** To provide a series of training courses on remote sensing technologies to FHP personnel.

### **Cooperators:**

Jule Caylor and staff  
R.S. Applic. Center  
Salt Lake City, UT

Andy Knapp  
R-4/FHP  
Boise, ID

Tim McConnell  
R-1/FHP  
Missoula, MT

Dave Bridgwater  
R-6/FHP  
Portland, OR

Bill Frament  
NE Area/FHP  
Durham, NH

Ron Kelley  
VT Dept. of Forests  
Morrisville, VT

Bob Martin  
WO Aviation Manag.  
Boise, ID

Larry Young  
USDI/Office of Aircraft Services  
Boise, ID

### **Accomplishments:**

- "Photo Interpretation for Hardwood Forest Health Survey" training course was conducted in Vermont in November, 1995. The course was tailored specifically to the Vermont statewide hardwood survey.
- "Natural Resource Aerial Survey Aviation Safety" training course was conducted in Lakewood, Colorado in April, 1996. This course was provided specific aviation safety and management information to Federal and State employees who conduct natural resource aerial surveys.
- "Integrating Remote Sensing into Operational Pest Detection and Monitoring Programs" training course was developed, covering remote sensing tools and related technologies and how they may be integrated into FHP's operational aerial survey. However, the course was canceled and is rescheduled for February 1997.

### **Funding:**

Source(s):

12,100 FHTET  
43,000 FHP to RSAC

Expenditure(s):

6,100 Contract  
6,000 Travel, training, and other  
43,000 RSAC

### **Final Product and Completion Date:**

- Photo Interpretation for Hardwood Survey course conducted: November 1995
- Integration of Remote Sensing course planned/curriculum prepared: December 1995
- Aerial Survey Aviation Safety course conducted: April 1996

## **Project C3: Airborne Video System Users Guide**

**Project Leader:** Dick Myhre

**Objectives:** To amend and update the Airborne Video System Users Guide to include the new developments for automated digital mosaicking of video imagery.

**Cooperators:**

Dave Linden  
Colorado State University  
Fort Collins, CO

**Accomplishments:**

The Airborne Video System Users Guide is being updated to include a section covering new components for acquiring data needed for automating the video image processing procedures. The new chapter addresses the use of each new component, how to assemble the new system configuration, installing the system in an aircraft, and revised airborne operations. A draft has been prepared and will be evaluated under operational conditions before the final version is printed and distributed.

**Funding:**

Source(s):		Expenditure(s):	
20,700	FHP	18,700	Contract
		2,000	Travel, training, and other

**Final Product and Completion Date:**

- New wiring diagrams for the system: July 1996
- Draft of new chapter: August 1996
- Operational test of new chapter: October 1996
- Final version of chapter: November 1996
- Printing and distribution: December 1996



## **Project C4: Vegetative Cover and Fire Fuels Database**

**Project Leader:** Ross Pywell

**Objectives:** To develop a vegetative cover and fire fuels data base from LANDSAT imagery for the State of Colorado in support of Region 2 and the Arapaho-Roosevelt National Forest

**Cooperators:**

Larry Mullen	Denis Dean
Region 2 - RRSU	Colorado State University
Denver, CO	Fort Collins, CO

**Accomplishments:**

Provided technical and contracting expertise to Region 2 in a cooperative project to develop a vegetative cover and fire fuels database for the State of Colorado. This project is now complete and the final product and report have been delivered to Region 2 by Colorado State University.

**Funding:**

Source(s):	Expenditure(s):
24,300     Region 2 Timber	24,300     Cooperative Agreement

**Final Product and Completion Date:**

- Land cover maps of 5 LANDSAT scenes covering Colorado: April 1996

## **Project C5: Airborne Sensor Evaluation and Development**

**Project Leader:** Ross Pywell

**Objectives:** To evaluate new sensor technologies such as multi-spectral video and digital photographic systems for forest vegetation stressor detection.

### **Cooperators:**

Tom Bobbe RSAC Salt Lake City, UT	Paul Greenfield RSAC Salt Lake City, UT	Henry Lachowski RSAC Salt Lake City, UT
Eric Johnson FHP-R2 Lakewood, CO	Andy Knapp FHP-R4 Boise, ID	Steve Munson FHP-R4 Ogden, UT
Lisa Levien FHP-R5 Sacramento, CA	Richard Spriggs FHP-R8 Pineville, LA	John Omer FHP-NA Morgantown, WV
Bill Frament FHP-NA Durham, NH	Diane Cote Manti-La Sal NF Price, UT	Bruce Silvey NF in Texas Lufkin, TX
Tim McConnell FHP-R1 Missoula, MT	Harold Thistle MTDC Missoula, MT	Dave Bridgewater FHP-R6 Portland, OR

Gordon Hosking  
Forest Research Institute  
Rotorua, New Zealand

### **Accomplishments:**

An extensive field test of the Kodak color-infrared digital camera was conducted this field season in Regions 2, 4, 8 and NA. Early results of the test in Region 4 were presented at the Forest Service Remote Sensing Conference. Work was begun on a project to evaluate subpixel analysis, a new image processing technique for change detection. The technique is being used in an attempt to detect spruce beetle damage on the Manti-La Sal National Forest in Utah. It is hoped that satellite imagery will provide a means of monitoring changes in forest health in areas where we can not afford to conduct routine aerial survey operations. Both of these projects have been supported extensively by the Remote Sensing Applications Center (RSAC) in Salt Lake City.

The Kodak CIR digital camera was developed through a cooperative effort between RSAC and Kodak. FHTET acquired one of the cameras through RSAC and offered it for testing by field units this past summer. Regions 2, 4, 8 and NA requested use of the camera. A mission reporting form was developed by FHTET. Each field unit was requested to complete the evaluation form for each mission and submit it along with copies of all digital imagery to FHTET at the completion of their missions. FHTET or RSAC personnel traveled to each field site to train the users in the use of the camera. A report detailing

the results of the field test will be completed in mid-FY97 (Region 8 and the New Zealand Forest Research Institute will not complete their testing until November) and distributed to all FHP offices.

We are searching for cost-effective methods for monitoring forest change. Region 5 has had success in using LANDSAT imagery and the Kauth-Thomas technique of change detection to monitor changes in forest condition in California. The purpose of this study is to look at another technique and conduct a comparison to the methods used in Region 5. This year, LANDSAT TM imagery from August 1985, July 1988, and July 1993 was acquired. We also acquired aerial photography taken in September 1991. Field data from 1994 and 1996 are also available. Initial image processing work was completed and reviewed at a meeting in August. A field trip is scheduled for October. A final report will be prepared and distributed in mid-FY97.

An evaluation of electronic moving maps displays for potential use by aerial survey personnel was initiated this field season. The evaluation is a cooperative effort between the Regions, RSAC, MTDC and FHTET. A site visit was made to British Columbia, Canada to observe a digital sketchmapping system in use there by the Ministry of Forests. An evaluation report and recommended system enhancements was developed and distributed to the field. A plan for follow-on work has been developed for FY97.

A paper describing the status of new digital video technology was written in cooperation with RSAC and distributed to the field via our new DG FHP remote sensing/GIS mailing list. A publication produced by RSAC describing the status and capability of new satellite systems to be launched over the next decade was distributed in a similar manner.

#### **Funding:**

Source(s):		Expenditure(s)	
74,000	FHTET	41,000	Contract
71,500	FHP to RSAC	15,000	Computer-related expenses
		18,000	Travel, training, and other
		71,500	RSAC

#### **Final Product and Completion Date:**

- Digital CIR image acquisition: November 1996
- Image interpretation and analysis: November 1996
- Digital camera evaluation report: December 1996
- Evaluate electronic moving map displays for incorporation into the aerial survey program: September 1996
- Electronic sketchmapping progress report and FY97 action plan: October 1997
- Manti-La Sal image acquisition: June 1996
- Initial subpixel analysis: August 1996
- Field review: October 1996
- Final report on subpixel analysis: July 1997



## **Project C6: Automated Mosaicking Development and Implementation**

**Project Leader:** Ross Pywell

**Objectives:** To complete the development and implementation of the automated mosaicking capability hardware and software for existing field-deployed video systems and the Kodak digital frame camera, including the integration of a 3-axis attitude sensor and encrypted GPS receivers.

### **Cooperators:**

Tom Bobbe  
RSAC  
Salt Lake City, UT

Dave Linden  
Colorado State Univ.  
Fort Collins, CO

Richard Spriggs  
FHP-R8  
Pineville, LA

Bill Frament  
FHP-NA  
Durham, NH

Jack Stranix  
Sarnoff Labs  
Princeton, NJ

Paul Greenfield  
RSAC  
Salt Lake City, UT

### **Accomplishments:**

An encrypted GPS receiver has been acquired and incorporated into the system. This permits the incorporation and use of more accurate GPS data without requiring the added step of post-differential correction. In cooperation with RSAC, we have evaluated several 3-axis attitude sensors. It has been determined that the 3-axis systems available on the market at this time would add excessively to the cost of the video systems. We have found that the Sarnoff Laboratory (formerly RCA Labs) in Princeton, NJ has developed an automosaicking capability for video systems in use by the military. The system utilizes on-board hardware and software to produce real-time mosaics from video imagery using an autocorrelation technique. The mosaics, while looking very good, are not georeferenced. A meeting was held at Sarnoff Labs to investigate the possibility of combining these two technologies. This effort will be pursued in FY97.

### **Funding:**

Source(s):	Expenditure(s):
33,000 FHTET	22,500 Contract
15,000 FHP to RSAC	5,500 Travel, training, and other
	5,000 GPS receiver
	15,000 RSAC

### **Final Product and Completion Date:**

- Integration of encrypted GPS receiver: November 1995
- Automosaic technical publication: September 1996
- Update of video manual (see task C3)

## **Project C7: Classified Sensor Evaluation**

**Project Leader:** Ross Pywell

**Objectives:** To evaluate the utility of various classified sensors for potential declassification and application to forest health monitoring.

**Cooperators:**

Tom Bobbe	Chuck Dull
RSAC	WO-Engineering
Salt Lake City, UT	Washington, DC

**Accomplishments:**

No progress was made on this task due to scheduling conflicts with other projects.

**Funding:**

Source(s):	Expenditure(s):
none	none

**Final Product and Completion Date:**

None

**Project C8: Remote Sensing Integration, Development and Implementation**  
(This task was combined with tasks C2 and C5)

## Focus Area D: Analysis and Modelling

### Project D1: Model Maintenance and User Support

**Project Leader:** Judy Adams

**Objectives:** To provide maintenance and user support for the western insect and pathogen simulation models and their links to the Forest Vegetation Simulator (FVS) model variants.

**Cooperators:**

Ralph Johnson, Gary Dixon, Rich Teck  
WO Forest Management Service Center  
Fort Collins, CO

Nick Crookston  
Intermountain Research Station  
Moscow, ID

FHP & Forest Management Model Contacts  
Regional, Forest and/or District Offices

**Accomplishments:**

Provided technical assistance to the model users, having documentation accessible, or correcting problems encountered while working with the models. The models were kept current by integrating the latest updates or corrections and providing the users with relevant information on how these changes will impact them.

The Annosus Root Disease Model had a number of changes this year as a result of users discovering errors and from the sensitivity analysis that was conducted this summer. A general system update was issued from the WO Forest Management Service Center in early July as bulletin #318. A few of the major highlights from this update included: 1) Expand event monitor capabilities; 2) Dead trees in the input data now show on the cycle 0 treelist; and 3) Board foot and cubic foot defect percents can now be entered separately. Also, the names of the models were also changed to reflect this latest development.

An FVS meeting between representatives from British Columbia Ministry of Forests, Intermountain Research Station, WO Forest Management Service Center and FHTET-FC was held this summer. Discussion focused on the organizational structures, responsibilities and duties held by various staffs involved with FVS and the insect and pathogen models.

**Funding:**

Source(s):

59,000 FHTET

Expenditure(s):

58,000 Contract

1,000 Travel, training, and other

**Final Product and Completion Date:**

- Current models available on the Data General and the PC: On-going



## **Project D2: PC Distribution of Models**

**Project Leader:** Judy Adams

**Objectives:** To (1) support the insect and pathogen models on the personal computer platform; to (2) provide access to the models through a bulletin board system; and to (3) support, maintain and provide technical assistance for the bulletin board system.

**Cooperators:**

Ralph Johnson, Gary Dixon, Rich Teck  
WO Forest Management Service Center  
Fort Collins, CO

FHP and Forest Management Model  
Contacts  
Regional, Forest, and/or District Offices

**Accomplishments:**

A Bulletin Board System went into effect midway through the fiscal year as a means of providing access to the FVS growth and yield models, and the insect and pathogen models for the personal computer users community. This was established to replace the distribution system currently being maintained by Washington State University. A short while later the models were also made available through an anonymous FTP site established by FHTET-FC. This broadened the distribution to include users with internet access.

The Bulletin Board System was established and then advertised through the model bulletin system, faxes, and training sessions. The comments from users have been positive in regards to the set-up and information provided. A one page info sheet was designed to assist users with the telecommunications settings required for accessing the bulletin board. This sheet also provides instructions on how to retrieve models through the anonymous FTP site.

The WO Forest Management Service Center has been utilizing the Bulletin Board System and the anonymous ftp site for distribution of the FVS growth and yield models and the associated documentation. Once these two distribution centers were established and tested, the WO-FMSC staff was informed of the layout and the steps necessary to port files over from the Data General.

**Funding:**

Source(s):

9,000 FHTET

Expenditure(s):

9,000 Contract

**Final Product and Completion Date:**

- PC bulletin board and anonymous FTP site: July 1996

## **Project D3: Model Documentation: RD, WPBR, Initialization Data for Models**

**Project Leader:** Judy Adams

**Objectives:** To (1) complete the User's Guide for the Western Root Disease, containing both the current Western Root Disease and Annosus Root Disease documentation; and to (2) begin documentation work on the White Pine Blister Rust User's Guide and the Initialization Data for Models Report.

### **Cooperators:**

John McLaughlin  
British Columbia Ministry of Forests  
Victoria, British Columbia

Sue Hagle  
FHP Region 1  
Missoula, MT

John Schwandt  
FHP Region 1  
Coeur d'Alene, ID

Susan Frankel  
FHP Region 5  
San Francisco, CA

Ellen Goheen  
FHP Region 6  
Medford, OR

Jerry Beatty  
FHP Region 6  
Gresham, OR

Tom Gregg  
FHP Region 6  
Portland, OR

### **Accomplishments:**

The Western Root Disease version 3 User's Guide and Model Description were completed and distributed to developer team members for the Western Root Disease Model version 3.0, which is a combination of the original Western Root Disease Model and the Annosus Root Disease Model. Arrangements have been made with Region 6 and staff members of FHTET-FC to work cooperatively on detailed documentation for data collection and basic information regarding requirements for each model.

Discussion and meetings have been planned for working on the White Pine Blister Rust model user's guide. This summer data was collected in Region 1, which can be used for examples in the documentation.

### **Funding:**

Source(s):  
5,000 FHTET

Expenditure(s):  
5,000 Contract

### **Final Product and Completion Date:**

- Western Root Disease User's Guide version 3.0: September 1996
- Western Root Disease Detailed Model Description: September 1996

## **Project D4: Dwarf Mistletoe Training Package**

**Project Leader:** Judy Adams

**Objectives:** To produce a training package on the Dwarf Mistletoe Model, including slides, overheads, and presenter's notes.

### **Cooperators:**

Rich Teck  
WO-Forest Management  
Service Center  
Fort Collins, CO

Jane Taylor  
FHP Region 1  
Missoula, MT

Mary Lou Fairweather  
FHP Region 3  
Flagstaff, AZ

Tom Gregg  
FHP Region 6  
Portland, OR

Ellen Goheen  
FHP Region 6  
Medford, OR

Brian Geils  
Rocky Mountain Station  
Flagstaff, AZ

### **Accomplishments:**

Individuals who have had experience in using the Western Root Disease Model training package were queried for their opinions on the development of the Dwarf Mistletoe package. They were asked to comment on the areas that were most helpful and those that they felt could be improved. Suggestions for improving the overall package were also solicited.

The dwarf mistletoe was selected as the next model from the results of the pest model review. The survey results indicated that this model is the most widely used by the largest number of people. The training package consisting of slides, presenter's notes and student handouts has been a benefit to the individuals involved in coordinating and presenting training sessions.

### **Funding:**

Source(s):  
8,500 FHTET

Expenditure(s):  
8,500 Contract

### **Final Product and Completion Date:**

- Dwarf Mistletoe Training Package: October 1996



## **Project D5: Model Users Training**

**Project Leader:** Judy Adams

**Objectives:** To (1) provide FHP field personnel with the skills to use and assist others in the use of growth and yield/insect and pathogen simulation models in forest resource planning and (2) to assist with any specialized training needs.

### **Cooperators:**

Rich Teck  
WO FMSC  
Ft. Collins, CO

Dawn Hansen  
FHP Region 4  
Ogden, UT

Joy Roberts  
FHP Region 4  
Boise, ID

Ellen Goheen  
FHP Region 6  
Medford, OR

John Guyon  
FHP Region 4  
Ogden, UT

Susan Frankel  
FHP Region 5  
San Francisco, CA

Mary Lou Fairweather  
FHP Region 3  
Flagstaff, AZ

Tom Gregg  
FHP Region 6  
Portland, OR

### **Accomplishments:**

A training session was originally planned to take place in Region 4, February 1996, in Boise, ID. This session was canceled and other training in coordination with the FVS introduction classes was conducted at various locations.

Instead of holding one extensive training session, we worked cooperatively with the Regions and Rich Teck of the WO-FMSC to provide short training opportunities. Working in conjunction with the Beginning FVS classes, Rich offered a half day segment for an introduction to pest models. The regional pathologists contributed extensively by making others aware of the insect and pathogen models and presented brief explanations and assisting the students through exercises in how to use the models. There were three sessions put on this past year, including Regions 3, 4, and 5.

### **Funding:**

Source(s):

500 FHTET

Expenditure(s):

500 Contract

### **Final Product and Completion Date:**

- Training sessions held in Regions 3, 4, and 5: Spring 1996

## **Project D6: PTIPS Database Support and Recorder**

**Project Leader:** Judy Adams

**Objectives:** To integrate existing and new permanent plot data in order to improve validation, calibration, and development of pest models and pest damage estimates, as applied to outbreak behavior. This project focuses on dwarf mistletoe, root disease, western spruce budworm, white pine blister rust, and comandra rust.

### **Cooperators:**

Sue Hagle	Pete Angwin	Jeri Lynn Harris
Nancy Campbell	FHP Region 2	FHP Region 2
FHP Region 1	Gunnison, CO	Rapid City, SD
Missoula, MT		

Terry Rogers	Borys Tkacz, PTIPS Mgr.	John Guyon
FHP Region 3	Mary Lou Fairweather	FHP Region 4
Albuquerque, AZ	FHP Region 3	Ogden, UT
	Flagstaff, AZ	

Susan Frankel	Ellen Goheen	Bruce Hostetler	Paul Hennon
FHP Region 5	FHP Region 6	FHP Region 6	FHP Region 10
San Francisco, CA	Medford, OR	Gresham, OR	Juneau, AK

### **Accomplishments:**

A data recorder program was completed for the Western Root Disease and Comandra Blister Rust. These were at the request of Region 2 personnel located in Gunnison Service Center and the Black Hills.

Assistance was provided to Region 1 this summer when it was discovered that the database did not have the capabilities to handle bare ground plots. This was discovered in areas where all the trees had been destroyed by root disease and yet the plot(s) needed to be monitored for regeneration. Modifications were made to the database and Region 1 was able to continue with their PTIPS activities.

### **Funding:**

Source(s):	Expenditure(s):
50,000      External (TDP)	45,000      Contract
	5,000      Travel, training, and other

### **Final Product and Completion Date:**

- Data Recorder: September 1996
- Technical Support: On-going
- Database Maintenance: On-going

## **Project D7: Develop Project 615 and MS-WINDOWS interfaces to pest models**

**Project Leader:** Patrice Janiga

**Objectives:** To (1) develop multi-platform computer interfaces to all pest extensions to FVS; to (2) ensure compatibility with the FVS interface(s); and to (3) identify and integrate user requirements for enhanced features not previously available with existing interfaces.

### **Cooperators:**

Nick Crookston	Gary Dixon	Tommy Gregg
Intermountain Research	Forest Management	Forest Insects & Diseases
Station	Service Center	Region 6
Moscow, ID	Fort Collins, CO	Portland, OR

### **Accomplishments:**

FHTET coordinated re-engineering the FVS Submittal System and pest models from the Data General system to an MS-DOS application. The Submittal System is distributed through the agency network and a bulletin board developed and maintained by FHTET. Intensive requirements analysis was conducted for all pest model interface components in preparation of an MS-WINDOWS implementation of keyword selection, organization, model execution, and output production and management. Porting of the pest model submittal system from the Data General to MS-WINDOWS has been designed and programming flexibility will provide a viable means of delivering the complex knowledge has been started. Version 1.0 of the MS-WIN submittal system will be completed in fiscal year 1997.

In order to initiate development of the Project 615 based graphical interface, FHTET provided computer systems programming and program review support to the Intermountain Research Station developing SUPPOSE. SUPPOSE is a graphical interface that operates with Microsoft Windows and Motif (compatible with new interfaces under the agency's Project 615 systems). This interface supports use of the Forest Vegetation Simulator and pest model extensions. As a result of a detailed review of SUPPOSE, actions for further improvement of the interface have been documented. FHTET provided funds to the Intermountain Research Station for Nick Crookston to integrate pest models within SUPPOSE and to work with FHTET to integrate SUPPOSE with INFORMS. Root disease model keyword generation was incorporated into SUPPOSE. Progress is being made to integrate other pest models by sometime in early fiscal year 1997.

### **Funding:**

Source(s):	Expenditure(s):
62,000 FHTET	62,000 Contract

### **Final Product and Completion Date:**

- Suppose... version 1.0 anticipated completion: September 1997
- MS\_WIN Submittal System version 1.0 anticipated completion: March 1997



## **Project D8: West Wide Pine Beetle Model Implementation**

**Project Leader:** Eric Smith

**Objectives:** To initiate the West Wide Pine Beetle Model for use on landscape-level ecosystem management and forest health protection projects.

### **Cooperators:**

Bill Schaupp	Dave Wood	Werner Kurtz
R-2 FHP	UC Berkeley	ESSA Ltd.
Lakewood, CO	Berkeley, CA	Vancouver, BC

Tom Gregg	Pat Shea	Jesse Logan
R-6 FID	PSW Station	INT Station
Portland, OR	Davis, CA	Logan, UT

### **Accomplishments:**

Model behavior testing began on two significant issues of the West Wide Pine Beetle (WWPB) model: incomplete stand data and effects of scale. Progress was made on calibration for West Coast conditions. A beta-test version was created for single stand usage.

Until now, FVS and the impact models have operated on a single stand basis. FHTET has been addressing challenges of incorporating multi-stand simulations into this model. Use of the Most Similar Neighbor (MSN) routines, developed by INT Station, has been suggested to estimate missing data at the tree level for large areas. We developed strategies for testing the effects of using MSN in FY 96, and incorporated the tests into the FY 97 plan of work.

The spatial considerations in the WWPB model cause its behavior to vary, depending on the size of the analysis area. Preliminary analyses were performed to test the magnitude of this effect. Since the effect appears to be significant, additional analyses have been planned for FY 97.

Progress was made in creating FVS files from the data and successfully making preliminary runs which reasonably represented actual growth and mortality. A presentation of mortality logic in the WWPB model and other models was presented to the North American Forest Insect Work Conference. An abstract was submitted to the 1997 FVS workshop.

### **Funding:**

Source(s):	Expenditure(s):
20,400 FHTET	12,500 Contract
	7,900 Travel, training, and other

### **Final Product and Completion Date:**

- Releasable version of Westwide Bark Beetle Model: Sept 1997

## **Project D9: Multipest Model Development**

**Project Leader:** Eric Smith

**Objectives:** To produce a usable pest modeling system that considers the total impact of pests on a forest over time through building and testing one or more prototype solutions for this problem.

### **Cooperators:**

Bill Schaupp  
R-2 FHP  
Lakewood, CO

Dave Wood  
UC Berkeley  
Berkeley, CA

Werner Kurtz  
ESSA Ltd  
Vancouver, BC

Tom Gregg  
Kathy Sheehan  
R-6 FID  
Portland, OR

Jim Byler  
R-1 FHP  
Couer d'Alene

Melinda Moeur  
Nick Crookston  
INT Station  
Moscow ID

### **Accomplishments:**

Work under this task also included progress on a revised Western Spruce Budworm Model, begun under a prior year TDP. In FY 96, FHTET consulted with ecologists and others to define the scope of a possible integrated model, and how it might interact with related systems.

A cooperative agreement was begun with the University of Montana to assess the BGC family of models for their potential integration into current insect and disease modeling system.

FHTET staff became members of the ID Team for the Cold Springs Ecosystem Analysis, Medicine Bow NF. In this capacity, FHTET provided input relating to modeling alternatives for this watershed level area.

Cooperation under the R-6 sponsor of the revised western spruce budworm TDP continued. FHTET staff organized the final model design review meeting and recoded major model sections.

### **Funding:**

Source(s):

37,000 FHTET

Expenditure(s):

16,000 Contract

15,000 Cooperative Agreement

6,000 Travel, training, and other

### **Final Product and Completion Date:**

- An evaluation of methods to combine FVS insect and disease models: August 97

## **Project D10: Multi-resource Model Support**

**Project Leader:** Eric Smith

**Objectives:** To provide support and coordination for multi-stand and multi-resource modeling efforts led from outside of FHTET

### **Cooperators:**

Elizabeth Reinhardt  
Colin Hardy  
INT-Fire Lab  
Missoula, MT

Rich Teck  
Gary Dixon  
For. Mgt Service Center  
Fort Collins, CO

Nick Crookston  
Melinda Moeur  
INT Station  
Moscow, ID

Tom Gregg  
R-6 FID  
Portland, OR

### **Accomplishments:**

Met with cooperators on various occasions for formal and informal discussions to accomplish objectives. FVS Fire Model test version completed. Served as a team member on the FVS Fire Model project. This model was based on the structure and code of the FHTET-sponsored Westwide Pine Beetle Model. The models are structure to allow for the possibility to merge the models into a single multi-stand disturbance model. FHTET provided input and advise on the implementation of the Fire Model into the user community.

Held meetings with modelers at the Missoula Fire Lab concerning FHTET plans to review landscape model approaches and feasibility of incorporating ecological process models or ecological state variables into FVS disturbance models. The Fire Lab has been involved in Fire-BGC, a related effort. Fire researchers agreed to cooperate in the FHTET effort. FHTET also began efforts to examine the behavior of INT Station research products when used with insect and disease impact models. These include Most Similar Neighbor and the Parallel Processor.

### **Funding:**

Source(s):

4,400 FHTET

Expenditure(s):

2,400 Contract

2,000 Travel, training, and other

### **Final Product and Completion Date:**

- Final implementation of the Fire Model: determined by sponsors
- Future support provided by FHTET: on an as-needed basis.



## **Project D11: Model Sensitivity, Validation, and Calibration**

**Project Leader:** Eric Smith

**Objectives:** To systematically test pest model behavior and results in order to provide appropriate parameters for operating the models over a wide range of conditions.

### **Cooperators:**

Dave Johnson	Susan Frankel	Nick Crookston	Tom Gregg
Bill Schaupp	R-5 FHP	INT Station	R-6 FID
R-2 FHP	San Francisco, CA	Moscow, ID	Portland, OR

### **Accomplishments:**

The primary purpose of this task is to provide support to FVS impact model users in testing and understanding model behavior. Primary efforts in FY96 were aimed at sensitivity testing of annosus in the Combined Root Disease Model. An extensive number of test runs were made and the results documented as part of a R-5 TDP. Procedures were used in testing this model which should prove useful with other models.

Because of the nearly infinite combinations of situations which users may apply the impact models to, it is not possible to fully test or preselect parameter values within the models. Our role in this effort is to provide statistical, modeling, and programming support and expertise to field staffs, especially those with particular interest and expertise in the various models.

For the annosus testing, we repeated a fractional factorial design sensitivity test which had been done on an earlier version of the model. This analyses is complete and the final draft of the report is being prepared as a FHTET report. Additional tests were performed on the model which concentrated on the influence of random variates on model variability. This was shown to be an important factor which has been previous ignored. Results of the tests will appear as a chapter in a PSW GTR covering the root disease model.

### **Funding:**

Source(s):		Expenditure(s):	
30,000	FHTET	40,000	Contract
15,000	TDP through R-5	5,000	Travel, training, and other

### **Final Product and Completion Date:**

- Annosus sensitivity test results in report and GTR chapter form: October 1996
- Presentation of annosus and related results at FVS Workshop: February 1997

## **Project D12: Pest Model Output Display**

**Project Leader:** Ross Pywell

**Objectives:** To (1) continue development of a visual output component for forest insect and disease models which will allow the display of pest impacts, forest fuels, and forest management alternatives and (2) develop an interface of these capabilities to INFORMS and the Forest Vegetation Simulator (FVS).

### **Cooperators:**

Brian Orland	John Wells	Tommy Gregg
Univ. of Illinois	Timber Management	FHP-R6
Champaign, IL	Washington, DC	Portland, OR
Bob McGaughey	Nick Crookston	
PNW	INT	
Seattle, WA	Moscow, ID	

### **Accomplishments:**

Region 6 FHP and PNW are developing a palette of SVS tree definitions that depict various stages of insect and pathogen damage. Once complete, FHTET will implement special output options within the pest models so that SVS will recognize the data and display the damaged trees.

SmartForest II, V.1.3 has been installed in Fort Collins and is available for demonstrations. V.1.3 enables the user to color ground surface by stand and to query stand data by pointing and clicking with the mouse on the display. Trees can be colored by dbh, height, and species. Individual tree records can also be accessed by point-and-click. The program is made available with demo data tables which need to be supplemented with real data by the end user. The operating manual has been updated to reflect recent changes.

A prototype map browser, Navigator, has been developed and implemented as part of SmartForest; however, it is expected that ArcView will replace this function in Forest Service situations.

### **Funding:**

Source(s):	Expenditure(s):
50,000 FHP	6,000 Contract
	40,000 Cooperative Agreement
	2,000 Travel, Training, and other
	2,000 Computer-related expenses

### **Final Product and Completion Date:**

- Installed SmartForest version 1.3: September 1996

## **Project D13: Biometrics Support**

**Project Leader:** Eric Smith

**Objectives:** To provide statistical support and consulting to field units, including project reviews and self-supporting training opportunities.

### **Cooperators:**

Gerald Hertel NA FHP Radnor PA	Roy Mita For. Mgt Serv Ctr Fort Collins CO	Rudy King Hans Schreuder RMS Station Fort Collins CO	Sandy Kegley R-1 FHP Missoula MT
Sally Campbell R-6 FID Portland, OR	Dave Johnson R-2 FHP Lakewood, CO	John Anhold R-4 FHP Odgen, UT	Mark Schultz R-3 FHP Albuquerque, NM
Susan Frankel R-5 FHP San Francisco, CA	James Linnane NA-FHP Durham, NH	Ron Kelly Forestry- St. of VT Burlington, VT	

### **Accomplishments:**

Consultations and reviews were performed for many FPH and FIDR cooperators. Work was begun on the third permanent plot survey of Vermont hardwoods. A biometrician was hired on the contract staff.

The analysis of the third measurement of Vermont hardwood tree health was begun in FY96. Field measurements were made in FY 96, and data will be analyzed and summarized in FY97 by FHTET.

FHTET provided representation for S&PF on the National 615 Statistical Software Committee. The Committee has gathered input from across the FS and has presented alternatives to the WO concerning FS statistics software needs and ways to meet them. This committee has also discussed related needs concerning training and consulting within the FS.

### **Funding:**

Source(s):	Expenditure(s):
32,000 FHTET	24,000 Contract
	8,000 Travel, training, and other

### **Final Product and Completion Date:**

This is a support activity which is ongoing, most final products are the responsibility of the field client.

- Vermont Tree Health Survey Report: April 1997
- Presentation of Holy Cross Forest Health Analysis at FVS workshop: February 1997



## **Project D14: Landscape Assessment Methodology**

**Project Leader:** Steve Williams

**Objective:** To (1) complete development of a landscape assessment methodology and to (2) testing and refining this methodology in Region 5 and/or Region 6.

### **Cooperators:**

James Byler	Susan Frankel	Ellen Goheen
Susan Hagle	FHP Region 5	FHP Region 6
FHP Region 1	San Francisco, CA	Medford, OR
Coeur d'Alene, ID		

### **Accomplishments:**

Specific accomplishments include: 1) a third paper by Lowell and Stipe (1996) concerning GIS techniques was presented thus completing a series of 3 papers that define the successional analysis methodology from concept, to describing analysis results, and to describing data management issues, 2) data structures and data accessible through ArcView on the 615 platform were refined and transferred to the Coeur d'alene and Missoula FH offices, 3) numerous Oracle PL\*SQL scripts used for intermediate processing and canned reports summarizing insect and pathogen successional roles were completed and used to provide needed planning information that is beginning to be used to help drive successional models, 4) R1 staff were trained in the use of ArcView, and to some extent Oracle SQL\*Plus to promote self sufficiency in accessing and manipulating project related data, 5) requirements for an interface to provide field user access to these assessment queries were reflected in the design of INFORMS 1.0 to be released very early in FY97, and 6) at the close of FY96, a followup TDP with R5 and R6 was being formulated to move forward with testing the methodology at different landscape levels and to produce an effective multi-regional procedure for assessing insect and pathogen successional roles.

### **Funding:**

Source(s):		Expenditure(s):	
18,000	FHTET contribution	77,000	Contract
65,000	R1 FH (TDP funds to FHTET)	5,000	Detailers
10,000	R1 FH (their expenses)	11,000	Travel, training, and other

### **Final Product and Completion Date:**

- project closeout expected: mid FY97.

## **Project D15: PTIPS Database Changes to AllVeg/PTIPS**

**Project Leader:** Judy Adams

**Objectives:** To modify the PTIPS database structure to an AllVeg/PTIPS database structure.

### **Cooperators:**

Ralph Johnson, Gary Dixon, Roy Mita, Tonya Smith  
WO Forest Management Service Center  
Fort Collins, CO

Ralph Warbington  
Land Management Planning Region 5  
Sacramento, CA

### **Accomplishments:**

The AllVeg and PTIPS databases are in the process of being merged into a new structure.

The PTIPS database was designed and developed from TDP funds for the purpose of meeting the needs and requirements of FHP personnel in monitoring, storing and analyzing permanent plot data. A meeting was held between representatives from WO-FMSC, R5, FHTET-FC and the FHP manager of the PTIPS project to determine a plan for merging the two databases. FHTET-FC did not have the funding to accomplish this project, so Region 5 offered to fund a person for a six month period.

This project will be released in October 1996. The new release will include the new database structure, as well as an updated user's guide. The menus, forms, queries, and reports have all been updated to reflect the new structure. Scripts have been created that will move the existing data from the old structure to the new. Conversion routines to load data into the new structure are currently in development.

### **Funding:**

Source(s):

30,000	External (Region 5)
10,000	FHTET

Expenditure(s):

37,000	Contract
3,000	Travel, training, and other

### **Final Product and Completion Date:**

- New database structure, updated user's guide, menus, forms, queries, and reports. Scripts for offloading and reloading existing data and reference tables, loading new structure, new forms, reports, menus, scripts, etc.: October 31, 1996

## Focus Area E: Decision Support Systems

### Project E1: Region 8 Forest Health Rulebase Toolkit

**Project Leader:** Steve Williams

**Objective:** To (1) provide timely oversight and consultation to Region 8 personnel in their effort to develop a Rulebase Toolkit and to (2) facilitate the transfer of this technology to other Regions.

**Cooperators:**

Forrest Oliveria	Eric Twombly	Ron Perisho	Texas A&M University
FHP Region 8	Pine RD	Jessieville RD	College Station, TX
Alexandria, LA	Wallowa-Whitman NF	Ouachita NF	

**Accomplishments:**

The beta version of the Rulebase Toolkit was successfully ported to primarily an Oracle Forms application in order to foster ease of future maintenance by the Forest Service. Functionality was added to the Toolkit to support building spatially oriented rulebases. Feedback from testing by FHTET, the Ouachita NF, and the Wallowa-Whitman NF generated additional design enhancements as well as eliminating program bugs. Due to these accomplishments, the software has progressed to the point of being a very stable Beta version that will be included as a product delivered with INFORMS 1.0 even though the Rulebase Toolkit is not scheduled for release as Version 1.0 until April 1997.

Other accomplishments include: 1) a paper by Williams and Holtfrerich (1996) presented at the American Society of Agricultural Engineers annual meeting in Phoenix, Arizona, 2) a poster presentation on rulebase technology at the SAF conference in Portland, Maine that was awarded a first place certificate for its quality, 3) draft user documentation created by Doug Rubel from R8 FH working in conjunction with a FHTET technical writer, and 4) generation of substantial interest in the product by several FS regions as accomplished through the efforts of Eric Twombly (R6 MS) working in conjunction with FHTET staff. (Note, FHTET was the lead on the paper and poster, FHTET cost shared travel expenses with R8 to facilitate production of the user documentation, FHTET facilitated Eric Twombly's work through a detail assignment.)

**Funding:**

Source(s):	Expenditure(s):
7,000 FHTET	11,000 Contract
9,000 R8 FH (TDP funds to FHTET)	43,800 Cooperative Agreement
49,400 R8 FH (other TDP funds)	2,000 Detailers
	8,600 Travel, training, and other

**Final Product and Completion Date:**

- Version 1.0 of the Rulebase Toolkit: March 1997



## **Project E2: INFORMS Reengineering: Sun Platform to Project 615 Platform**

**Project Leader:** Steve Williams

**Objective:** To reengineer INFORMS-R8 from the Sun Workstation to the IBM Workstation using related Project 615 software

### **Cooperators:**

Forrest Oliveria	Eric Twombly	Ron Perisho	Texas A&M University
FHP Region 8	Pine RD	Jessieville RD	College Station, TX
Alexandria, LA	Wallowa-Whitman NF	Ouachita NF	

### **Accomplishments:**

Version 1.0 of INFORMS will be installed on the Jessieville Ranger District of the Ouachita NF in mid October 1996, roughly 6 weeks behind the original schedule. INFORMS version 1.0 represents a tremendous effort by multiple staffs working cooperatively to create a product that is substantially improved from the previous prototype. Starting with a Requirements Document as a blueprint last fall, the entire system was built on the 615 platform in slightly less than a year.

INFORMS 1.0 includes a range of planning functions accessed through the ArcView interface and Oracle Forms. An alpha version of INFORMS was installed on 4 sites in spring 1996 (FHTET, Jessieville RD R8, Wallowa-Whitman SO R6, Kisatchie NF R8). Testing results and feedback helped debug, refine existing functions, and incorporate newer functions that will be reflected in Version 1.0. An initial draft user manual was written and is being refined into a final manual for release in November 1996. Demonstrations were given to staff from every region as well as IS&T, LMP, and Timber Management staff at the WO. Following implementation of Version 1.0 on the Ouachita NF in October, the other 3 test sites will be upgraded before implementing on more sites. A half day of INFORMS training was requested for and will be given at the eastern Region University (R8 & R9) in February 1997.

### **Funding:**

#### **Source(s):**

63,000	FHTET
6,000	R8 FH
17,000	R8 Ouachita NF
5,000	R6 MS-Eric Twombly

#### **Expenditure(s):**

34,000	Contract
25,000	Cooperative Agreement
4,000	Detailers
28,000	Travel, training, and other

### **Final Product and Completion Date:**

- Version 1.0 of INFORMS: October 1996
- User Manual: November 1996
- System operational on 4 sites: December 1996

## **Project E3: Landscape-Level Assessment: INFORMS Integration**

**Project Leader:** Steve Williams

**Objectives:** To (1) incorporate the landscape assessment queries and other relevant spatial analysis routines and reporting routines within the reengineered INFORMS framework in order to test the flexibility of INFORMS and (2) to demonstrate the utility of the INFORMS DSS.

**Cooperators:**

Texas A&M; R8 FHP staff, R1 FHP staff.

**Accomplishments:**

Due to lack of staff resources (only 1 week available versus 12 weeks of contract labor allocated for this task in the plan of work) which impacted task D14 as well as this task, only modest progress was made. It was a higher priority to move forward with task D14 before addressing this task. Meetings held in conjunction with task D14 were used as a vehicle to gather requirements for integration of assessment queries within INFORMS. The design of INFORMS reflects requirements to support the assessment queries and integration should move forward smoothly once the assessment queries and reports are finalized. The missing piece to finish the intent of this task is refinement of the queries and reports as independent tools so that they can then be integrated within INFORMS. The queries and reports currently do not include capabilities for the end-user to adjust parameters through an easy interface and these tools have not been generalized to support use beyond the project dataset.

Accomplishments include: 1) requirements were gleaned from discussions with R1 staff, 2) INFORMS includes a tool dependency function to support these types of tools, 3) INFORMS includes a project type function to associate these tools with a specific type of analysis effort, and 4) INFORMS includes data management functions to handle applying these tools to various project datasets.

**Funding:**

Sources:

2,000 FHTET

Expenditure(s):

2,000 Contract

**Final Product and Completion Date:**

- Products from the R1 TDP: mid FY97
- Integration of the R1 TDP products into INFORMS: mid FY97

## **Project E4: Suppose... Integration within INFORMS**

**Project Leader:** Steve Williams

**Objectives:** To (1) explore and document, through prototyping and discussion, integration issues involved with integrating Suppose... within the INFORMS framework and to (2) identify integration strategies to guide formal linkage of Suppose... to INFORMS once both systems are more stable.

**Cooperators:**

WO-TM; Eric Twombly, R6; Texas A&M; Nick Crookston, Int Sta

**Accomplishments:**

Despite no available contract labor for this task (8 weeks were allocated in the plan of work), several meetings were held with cooperators to discuss ideas and schedule intermediate tasks. Most activity occurred late in the FY since Suppose... was not developed to the point or available on the 615 platform to justify addressing this task. A meeting with Nick Crookston, Eric Twombly, and FHTET staff in mid summer created requirements and some design specifications for blending Suppose... within INFORMS in a user-friendly way. The analysis and design criteria were outlined and discussed with Texas A&M in late summer and a plan of action outlined for were allocated in the plan of work), several meetings were held with cooperators to discuss ideas and schedule intermediate tasks. Most activity occurred late in the FY since Suppose... was not developed to the point or available on the 615 platform to justify addressing this task. A meeting with Nick Crookston, Eric Twombly, and FHTET staff in mid summer created requirements and some design specifications for blending Suppose... within INFORMS in a user-friendly way. The analysis and design criteria were outlined and discussed with Texas A&M in late summer and a plan of action outlined for completing the integration of Suppose... within INFORMS by 2/97. A followup meeting between Eric Twombly and Texas A&M staff took place in September to clarify and further refine the requirements for what Texas will build in the next few months. The lack of contract labor although not derailing this task has resulted in a lack of thorough hardcopy documentation for integration options and issues, and a lack of prototyping activity by FHTET staff. Actual prototyping and development to date is being done by Texas A&M with mostly verbal direction from the project leader and external cooperators.

**Funding:**

No funds were expended on this task other than federal time.

**Final Product and Completion Date:**

- Suppose... scheduled to be integrated within INFORMS: February 1997



## **Project E5: GypsES Status Evaluation**

**Project Leader:** Steve Williams

**Objectives:** To formally evaluate the status of the GypsES Decision Support System to produce a plan of action for potential re-engineering and future distribution and maintenance.

**Cooperators:**

Dan Twardus  
NA FHP Staff

John Ghent  
R8 FHP

Kurt Gottschalk  
NE Station

**Accomplishments:**

This task was directly impacted by the furlough since FHTET had scheduled to initiate this right at the time the furlough occurred. Work began in earnest on this task in April/May 1996. FHTET staff in conjunction with the GypsES team produced a detailed outline of issues and questions to address during the formal review meeting. A meeting held in Morgantown in August between FHTET staff and GypsES team produced valuable information which is currently being compiled into a published report. As FY96 ends, the report is in draft stages and should be complete by the end of October. The delay beyond FY96 was by mutual agreement between the GypsES team and FHTET to accommodate finding a meeting date (August) that enabled most interested parties to attend. This date pushed the overall schedule back by 4 to 6 weeks. The work to date has been very fruitful and the final report is likely to exceed 30 pages and will contain information useful for understanding and managing any large FH sponsored software development project.

**Funding:**

Sources:

7,000 FHTET

Expenditures:

4,400 Contract

2,600 Travel, training, and other

(an additional 2,500 will be spent in October (FY97) to complete task)

**Final Product and Completion Date:**

- GypsES Status Review Report published: November 1996

## **Project E6: Decision Support Systems Coordination**

**Project Leader:** Patrice Janiga

**Objectives:** To provide information and serve as contact between Forest Health Protection projects and other Forest Service Decision Support System development teams.

### **Cooperators:**

Todd Mowrer	Joyce Thompson	Keith Reynolds
InterRegional Ecosystem	Ecosystem Management	Pacific Northwest
Management Coordinating	Analysis Center	Research Station
Group Task Force Leader	Fort Collins, CO	Corvallis, OR
Eric Twombly	Kendrick Greer	Terry Shore
InterRegional Ecosystem	Ecosystem Management	Forest Management
Management Coordinating	Analysis Center	British Columbia
Group Task Force Member	Fort Collins, CO	

### **Accomplishments:**

FHTET presented briefings to task force members representing the InterRegional Ecosystem Management Coordinating Group in October and November 1995 and March 1996. FHTET presented briefings to representatives of NRIS coordinating team in November 1995.

FHTET coordinated reporting of decision support system requirements and ongoing development to the Interregional Ecosystem Management Coordinating Group via the task force formed to assess decision support system requirements and current development activities within the Forest Service. FHTET worked with users of INFORMS to compose a detailed summary of INFORMS capabilities and future development plans. FHTET reviewed the draft report and provided findings and suggestions to the report editor, Todd Mowrer. The report has been completed and is in print in preparation for final distribution in October 1996.

### **Funding:**

Source(s):	Expenditure(s):
none	none

### **Final Product and Completion Date:**

- Assessment of Decision Support Systems for Ecosystem Management: October 1996

## **Focus Area F: Information Display**

### **Project F1: GIS/Remote Sensing/Data Visualization Application Support**

**Project Leader:** Ross Pywell

**Objectives:** To provide training, support and leadership to FHTET, FPM field units, and domestic and international cooperators in the evaluation, use and application of remote sensing, image processing, data visualization and GIS technologies.

#### **Cooperators:**

Richard Spriggs  
FHP-R8  
Pineville, LA

John Knighten  
FHP-R8  
Asheville, NC

Bill Cooke  
Research-SO  
Starkeville, MS

Brian Orland  
Univ. of Illinois  
Champaign, IL

Terry Daniel  
Univ. of Arizona  
Tucson, AZ

Alan Thorn  
Forest Research Institute  
Rotorua, New Zealand

Burhanuddin Sarbini  
Ministry of Forestry  
Jakarta, Indonesia

Carl Sumpter  
Medicine Bow NF  
Laramie, WY

Bill Frament  
FHP-NA  
Durham, NH

Helen Maffei  
FHP-R6  
Bend, OR

Ann Lynch  
RMS  
Flagstaff, AZ

#### **Accomplishments:**

Training was provided to FHP Region 8 and Northeastern Area (Durham Field Office) in the use of the new video automosaicking equipment and software. Region 8 has now purchased this equipment. FHTET will provide documentation of the system and assistance in configuring the hardware and software in November. Training was provided to FHP Region 8 (Asheville Field Office) in the use of the MIPS image processing software.

FHTET and its cooperators at the Universities of Illinois and Arizona provided support to a data visualization and perception study being conducted by the New Zealand Forest Research Institute. This work was done through a cooperative agreement between NZ-FRI and FHTET. A final report will be made available for distribution in early FY97.

In cooperation with Research, FHTET is providing assistance in the acquisition and implementation of airborne videography in Indonesia. Training of Indonesian personnel was conducted this summer.

Developed a DG mailing list of FHP personnel and other cooperators with an interest in remote sensing and GIS. The mailing list is used to distribute reports on these technologies and to notify people of publication availability.

FHTET continued to maintain and support the Fort Collins GPS community base station in cooperation with Region 2. The base station and associated computer bulletin board provides GPS correction files for Forest Service and other users within a 300 mile



radius of Fort Collins.

A brochure describing data visualization technology and several applications was produced.

**Funding:**

Source(s):

17,000 FHTET

Expenditure(s):

11,000 Contract

4,000 Travel, training, and other

2,000 Computer-related expenses

**Final Product and Completion Date:**

- R8 automosaic training: January 1996
- NA automosaic training: July 1996
- R8 MIPS training: July 1996
- New Zealand data visualization project: September 1996
- Indonesia video training: August 1996
- Brochure describing visualization applications: September 1996

## **Project F2: SmartForest Implementation (TDP)**

**Project Leader:** Ross Pywell

**Objectives:** To provide support for the Technology Development Project, which will result in the implementation of the SmartForest visualization software on the Dixie National Forest.

### **Cooperators:**

Steve Munson  
FHP-R4  
Ogden, UT

Brian Ferguson  
Randy Hayman  
Dixie National Forest  
Cedar City, UT

Brian Orland  
Univ. of Illinois  
Champaign, IL

### **Accomplishments:**

The SmartForest visualization software was installed on the Project 615 equipment at the Dixie National Forest in April. University of Illinois, Forest and FHTET personnel cooperated in this effort. At the time of installation, the OpenGL graphics libraries needed to run SmartForest were not included on the 615 software distribution, although they were available under the contract. Forest and FHTET personnel are pursuing means to obtain OpenGL from the Forest Service OSE lab in Missoula or to find another solution. The installation is now expected to be completed in October 1996.

### **Funding:**

Source(s):	Expenditure(s)
12,000 FHTET	11,000 Contract
	1,000 Travel, training, and other

### **Final Product and Completion Date:**

- Implementation of the software: October 1996
- Evaluation Report: July 1997

## **Focus Area G: Value Determination**

### **Project G1: Pest-Related Value Research Review**

**Project Leader:** Eric Smith

**Objectives:** To identify, gather, review, and build a database of pest-related value research; to determine the needs of FHP managers for value-related information.

**Cooperators:**

John Loomis  
Michele Haefele  
Colo State Univ  
Fort Collins CO

George Peterson  
Tom Brown  
RM Station  
Fort Collins CO

Tom Holmes  
SO Station  
Research Triangle NC

Dave Bengston  
NC Station  
St Paul MN

**Accomplishments:**

Reviews of previous research and management studies were performed on non-market pest impacts and pest impacts on scenic beauty. A joint project with the PSW Station was developed which will provide \$10,000 in funding to FHTET for FY97. A study of attitude measurement techniques was developed which will be 100% funded by RM Station, providing \$18,000 to FHTET in FY97. In cooperation with Colorado State University, a test of the use of conjoint analysis was developed.

**Funding:**

Source(s):

34,600 FHTET

Expenditure(s):

32,100 Contract

2,500 Travel, training, and other

**Final Product and Completion Date:**

- Non-market insect impact review will be published as FS research publication or FHTET report: December 1996
- Scenic beauty impact review published as FHTET report: November 1996
- Revised version submitted to a professional journal: January 1997



## **Project: G2 Forest Service Value Analysis**

**Project Leader:** Eric Smith

**Objectives:** To finish ongoing reviews of Forest Service valuation and risk approaches to program and project analyses.

### **Cooperators:**

John Loomis  
Michele Haefele  
Colo State Univ  
Fort Collins CO

George Peterson  
Bev Driver  
RM Station  
Fort Collins CO

Armando Gonzalez-Cabanes  
PSW Station  
Riverside CA

Dave Cleaves  
SO Station  
New Orleans LA

### **Accomplishments:**

Completed review with Colorado State University cooperator of program and project analyses. Reviews reveal a lack of a consistent approach to identifying and evaluating value elements, but planning documents and research missions show a clear recognition that the entire range of commodity and non-commodity values need consideration.

Provided economist staffing to the Mexican pest risk assessment team, included team meeting participation, economic analysis and report documentation.

### **Funding:**

Source(s):

16,200 FHTET

Expenditure(s):

13,200 Contract

3,000 Travel, training, and other

### **Final Product and Completion Date:**

Analysis review is complete. Future work may be proposed for partial or total funding by fire research project in the area of risk assessment methodologies.

Draft Mexican risk assessment is complete. Final draft input expected by 12/96.

## **Focus Area H: Communications**

### **Project H1: FHTET Communications Support**

**Project Leader:** Patrice Janiga

**Objectives:** To provide support to external communications for the entire Forest Health Technology Enterprise Team.

**Cooperators:**

Linda Feldman  
Public Affairs Office  
Washington, DC

**Accomplishments:**

The Communications Team adopted responsibilities for production of the FHTET Communications Plan and related information. The team has completed the production and distribution of three Enterprise Team Updates. Updates are distributed in hardcopy to over 1600 people through direct mail and local federal mail distribution channels. Each update is also formatted for distribution via the agency wide-area network and the Internet.

The Communications Team also designed FHTET contact/business cards, developed the FHTET Communications Plan (with advice from Linda Feldman), and developed invitations and announcements for the FHTET Open House conducted in April 1996.

**Funding:**

Source(s):	Expenditure(s):
57,700 FHTET	57,700 Contract

**Final Product and Completion Date:**

- Four quarterly issues of the Enterprise Team Update: October 1995, January 1996, April 1996, July 1996
- Publication Guidelines: January 1996
- Revised Publication Guidelines: August 1996
- Communications Plan for the Enterprise Team: September 1996

## **Project H2: Education/Training Certification Program Development**

**Project Leader:** Dick Myhre

**Objectives:** To evaluate options and develop procedures for establishing an education accreditation/certification program for in-house training activities.

**Cooperators:**

Jule Caylor	Liz Wegenka	Gordon Lehman
RSAC	GSC	Terry Daniel
Salt Lake City, UT	Salt Lake City, UT	University of Arizona
		Tucson, AZ

**Accomplishments:**

A Cooperative Agreement was established with the University of Arizona in late FY95 to (1) develop a draft proposal for an accreditation program, (2) discuss standard formats for training manuals, trainer standard, and operation procedures, and (3) develop a training course examination/testing process through the University of Arizona.

Several scoping and planning meetings were held to evaluate options and develop procedures for a proposed education accreditation program for FS in-house training. Meetings were attended by members of RSAC, GSC, U. of AZ/School of Renewable Resources, and FHTET-Fort Collins.

Several Forest Service training manuals have been delivered to the University for review and determination as to their quality and quantity of information in order to meet university standards.

This activity was put on hold for the remainder of FY96 until a decision is made on how to proceed with this venture. The Cooperative Agreement was extended to FY97.

**Funding:**

Source(s):	Expenditure(s):
5,000 FHTET	15,000 RSAC
15,000 FHP to RSAC	5,000 Travel, training, and other

**Final Product and Completion Date:**

No products as this task was put on hold until FY97.



## **Project H3: World Wide Web Server Development**

**Project Leader:** Dave Roschke

**Objectives:** To (1) provide platforms for internal development of, and external access to, Internet services; to (2) provide support and infrastructure for preparing and converting FHTET products, services, and information into Internet-ready products, services, and information; and to (3) make this information available on the Internet.

**Cooperators:**

Andy Wilson  
USDA FS, WO-PAO  
Washington, DC

Grant Dekker  
USDA FS, WO-IS&T  
Washington, DC

Leah Clark  
USDA FS, WO-FHP  
Washington, DC

**Accomplishments:**

The technology infrastructure (Internet connectivity and hardware and software configuration) for providing Internet information services to a global audience was developed and implemented for FHTET and offered to other local detached units, to the Rocky Mountain Station, and to other FHP units. Access to other Internet services was developed and made available to FHTET and all other Forest Service personnel in Fort Collins. FHP and FHTET information was developed, prepared for the Internet, and presented to external audiences on the World Wide Web. FHTET models were made available for downloading via FTP. Assistance in using and preparing information for presentation on the Internet/WWW was provided to other Forest Service staffs and groups.

A World Wide Web and FTP server for FHTET was developed and brought on line. Information about FHTET has been placed on the server and as updated information about our projects, products and partners is currently being prepared and when completed will be prepared for the Web and will replace the information now available. PC versions of the FVS variants and pest extensions have been made available for users to download.

Experimentation with interactive maps for subjects such as FHP assistance to other agencies is underway. In cooperation with FHP, PAO, and others in Washington, FHTET helped prepare and now hosts the World Wide Web presentation of the Forest Service's national perspective on Forest Health—the first comprehensive and coordinated Forest Service presentation of any given topic on the Web. This information is all coordinated with, and linked to and from, the primary Forest Service web server in Washington, DC for maximum public visibility.

FHTET also provided a number of other related services to other Forest Service units and to the Fort Collins community:

- The FHTET web server is the home for the "Forest Service Offices in Fort Collins" page. This page provides a link to the local Forest Service units through FortNet, the local on-line source for information for and about Fort Collins. This page provides links to and information about the Arapahoe-Roosevelt National Forest and Pawnee National Grassland, the Rocky Mountain Forest and Range Experiment Station, and the Washington Office detached units in Fort Collins.

- The FHTET web server hosts Forest Service home pages for the Tribal College Initiative and Procurement and Property Services. The Rocky Mountain Station is also preparing a home page and web site to be hosted by FHTET.
- Assistance and consultation in scoping, planning, and preparing Internet information and services was provided to other FS staffs, including regional Forest Health Protection staffs, the Rocky Mountain Station, the Stream Team, the Tribal College Initiative, and the Procurement and Property Systems staff.
- As a member of the Public Relations Team for the Fort Collins National Resources Research Center, provided Internet expertise and worked with APHIS, ARS, NRCS, NBS, OO, Colorado State University, and other Forest Service representatives in scoping and planning Internet information services for the Center.
- The "Internet Station" provides access to Internet services in a centralized location available for use by all Forest Service employees in Fort Collins. This station has received wide use by other WO detached and Rocky Mountain Station staff.
- Internet access obtained by FHTET was shared with other FS staffs co-located with FHTET, including the Ecosystem Management Analysis Center and the Procurement and Property staffs.
- Posters and demonstrations of the FHTET web server and the World Wide Web in general were prepared and presented to the FHTET Steering Committee and at the annual all FHTET meeting.
- A prototype "Forest Health Forum" web site was developed and presented to FHP staff in Washington. Although never fully implemented, this prototype served as a catalyst for drawing attention to the some of the potential uses of the World Wide Web, and led to increased interest in and support for FHTET efforts.

#### **Funding:**

##### **Source(s):**

9,100 FHTET

##### **Expenditure(s):**

8,800 Computer-related expenses  
300 Travel, training, and other

#### **Final Product and Completion Date:**

- FHTET Web Site operational: February 1996
- Forest Health Web Site operational: September 1996

## **Project H4: World Wide Web Workshop**

**Project Leader:** Dave Roschke

**Objectives:** To hold a workshop to introduce Internet and WWW services to FHP personnel from Regions, Stations, the Northeast Area, and the Washington Office in order to (1) increase familiarity with Web services throughout FHP and to (2) discuss information services that FHP should provide.

### **Cooperators:**

Leah Clark WO-FHP Washington, DC	Andy Wilson WO-PAO Washington, DC	Grant Dekker WO-IS&T Washington, DC
Larry Stipe FHP-R1 Missoula, MT	Dick Dieckman RR-R2 Lakewood, CO	Steve Dudley FHP-R3 Flagstaff, AZ
Joy Roberts FHP-R4 Boise, ID	John Kliejunas FHP-R5 San Francisco, CA	Kathy Sheehan FHP-R6 Portland, OR
Wes Nettleton FHP-R8 Atlanta, GA	Anthony Elledge FHP-R8 Asheville, NC	Beth Schulz FHP-R10 Anchorage, AK
Joe O'Brien FHP-NA St. Paul, MN	Chuck Liff FHM (BLM) Las Vegas, NV	Jessie Micales FPL Madison, WI
Andy Gillespie FHM (NEFES) Radnor, PA	Gerald McDonald INT Moscow, ID	Tom Rice INT Moscow, ID

### **Accomplishments:**

FHTET sponsored the kick-off meeting for a group of Internet Coordinators for each Region, Area, and Forest Health Monitoring unit. The meeting provided an opportunity to meet the other coordinators; an introduction to the Internet and World Wide Web; an opportunity for hands-on access to the World Wide Web through personal computers equipped with web browsers and live Internet connections; and a forum to discuss a coordinated approach for Forest Health units to provide consistent Internet/WWW services. Representatives from WO-IS&T and WO-PAO also attended the meeting, presenting the current Forest Service perspective on Internet use, Internet services, information preparation and organization, policy, and new developments.

All of these topics were discussed in the context of the Forest Health Communications Plan and the National Reporting Framework. A "thesis statement" was developed to describe the objectives of the "Forest Health National Perspective and Conditions" pages. General guidelines were agreed upon for look, feel, and content of associated pages across the Regions. A general consensus on the role of the Internet Coordinators and the



next steps to be taken was achieved. The near-term result will be a coordinated presentation of Forest Health conditions reports from across the country; for the longer-term, the first steps have been taken toward a deeper level of coordinating forest health-related Internet information services.

**Funding:**

Source(s):		Expenditure(s):	
3,600	FHTET	14,000	Travel, training, and other
10,400	Workshop Participants		

**Final Product and Completion Date:**

- Forest Health Internet Coordinators' Meeting: September 1996

## **Project H5: FHTET Presentation Graphics**

**Project Leader:** Sally Scrivner

**Objectives:** To (1) maintain and update the Forest Health Technology Enterprise Team presentation graphics packages and (2) to provide technical assistance in modifying and improving communication materials for presentation by FS personnel (FHTET, Regions, Area, and WO).

### **Cooperators:**

USDA FS  
FHTET Staff, Davis  
Davis, CA

USDA FS  
FHTET Staff, Morgantown  
Morgantown, WV

USDA FS  
FHTET Staff, Fort Collins  
Fort Collins, CO

USDA FS  
Ellen Goheen, R-6  
Medford, OR

### **Accomplishments:**

Maintained a FHTET overview graphics package which presents a current overview of the Forest Health Technology Enterprise Team's expertise and technology. This package was used in briefings and demonstrations to illustrate the strategy for making appropriate technology available to meet emerging forest health challenges. It was distributed to FHP, WO, FHTET-Davis, and FHTET-Morgantown. It is under constant revision.

Participated actively on the Poster Session Team created by FHTET-FC in order to create multiple posters for the FHTET Steering Committee Meeting held in Fort Collins, CO in April of 1996.

Designed and created a poster for the Western Root Disease Model Version 3.0 to be presented at the WFIDIC in September of 1996.

### **Funding:**

Sources:

3,000 FHTET

Expenditure(s):

3,000 Travel, training, and other

### **Final Product and Completion Date:**

- Presentation graphics, brochures, flyers, and posters: Ongoing.

## **Focus Area I: Decision Support Systems for Pest Control**

### **Project I1: Vegetation Management Options for Enhancing Ecosystem Health**

**Project Leader:** Jack Barry

**Objectives:** To demonstrate and evaluate herbicide ground treatment methods for supporting species diversity, ecosystem management, and forest health in a middle-aged Douglas-fir forest.

**Principal Cooperators:**

Mike Newton  
Oregon State University  
Corvallis, OR

Max Ollieu  
FHP, R-6  
Portland, OR

National Biological Survey  
Washington, DC

Oregon State Legislature  
Eugene, OR

**Accomplishments:**

Ground spray treatments have been completed in Oregon by Mike Newton, OSU. FHTET-Davis' role provided spray technology, calibration, system characterization, and data analyses. Treatments were highly successful, and efficacy will be monitored for support of biodiversity in a Douglas-fir ecosystem. The National Biological Survey is the primary contractee on this project. Over the next 12 months, Mike Newton and students will be monitoring and comparing to controls stand composition, species mix, species diversity, and enhancement of understory vegetation composition under thinned stands of Douglas-fir in the Pacific Northwest where management objectives favor multiple canopy layers of coniferous cover.

**Funding:**

Source(s):

10,000 FHTET  
10,000 Oregon State Legislature  
45,000 NBS

Expenditure(s):

65,000 Cooperative Agreement  
with Oregon State University

**Final Product and Completion Date:**

- Report: September 1997



## **Project I2: Time of Day Study/Temperature**

**Project Leader:** Jack Barry

**Objectives:** To (1) investigate the influence of vertical temperature difference (stability) on the canopy penetration, drift, and fate of aerial sprays applied over orchards and forests and to (2) conduct such tests in both deciduous and coniferous canopies with partners from the University of California, Davis Campus (UCD), the State of California, U.S. Forest Service, and private industry.

### **Cooperators:**

Bill Steike  
Norm Akesson  
Frank Zalom  
UCD  
Davis, CA

Milt Teske  
Continuum Dynamics, Inc.  
Princeton, NJ

Harry Hubbard  
NE Station  
Hamden, CT

Harold Thistle  
MTDC  
Missoula, MT

Bill May  
Agricultural Research Station  
Hamilton, New Zealand

### **Accomplishments:**

Project postponed due to adverse weather conditions that conflicted with field study design. Project will be managed by Harold Thistle, MTDC in conjunction with other projects in the 1997-1998 time frame.

### **Funding:**

Source(s):

35,000 FHTET-Davis

Expenditure(s):

35,000 Cooperative Agreements

### **Final Product and Completion Date:**

Postponed

## **Project I3: Field Meteorology Handbook**

**Project Leader:** Jack Barry

**Objectives:** To prepare and publish a book on complex and forest meteorology for use in planning and conducting meteorologically sensitive forestry applications, especially prescribed burning, smoke management, and aerial spraying.

### **Cooperators:**

Andy Edman  
National Weather Service  
Salt Lake City, UT

Bruce Grim  
US Army  
Dugway, UT

Peter Lahm  
Tonto NF  
Phoenix, AZ

Dave Whiteman  
Dept. of Energy  
Battelle Laboratories  
Richland, WA

Harold Thistle  
MTDC  
Missoula, MT

Allen Farnsworth  
Cococino NF  
Flagstaff, AZ

### **Accomplishments:**

The Field Meteorology Handbook has been drafted and is out for review. This handbook will be used as a training and field reference document for those who conduct meteorologically sensitive forestry operations (specifically prescribed burning, smoke management, and aerial spraying) for the purpose of environmentally sensitive management of spray drift and smoke dispersion.

The text is being prepared primarily by Dave Whiteman, Battelle NW, via an interagency agreement with the Department of Energy, with contributions of two chapters by Forest Service author. An editorial board made up of scientists from the National Weather Service (NWS), the Department of Energy, the US Army, and the USDA Forest Service has been established to contribute and provide critical review. Project has been coordinated with WO staffs by Ann Bartuska and with Boise Interagency File Center by Dave Whiteman. Drafts were mailed in September to the other writers—Peter Lahm, Allen Farnsworth, Harold Thistle, and Jack Barry. Peter and Allen were contacted in 1996 and agreed to write the prescribed burning and smoke management section, Chapter 7 (Fire Weather and Smoke Management) and Harold and Jack will write Chapter 8 (Aerial Spraying). Department of Energy became a full partner on this project agreeing to provide the color illustrations and editing.

### **Funding:**

#### **Source(s):**

25,000	US Army
25,000	National Weather Service
25,000	Department of Energy
25,000	FHTET

#### **Expenditure(s):**

100,000	Cooperative Agreement
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### **Final Product and Completion Date:**

- Field Meteorology Handbook: FY98

## **Project I4: Hardwood Canopy Description in FSCBG Model**

**Project Leader:** Jack Barry

**Objectives:** To provide the FSCBG model with the capability to predict insecticide spray coverage in various types of eastern hardwood canopies subject to gypsy moth attack.

**Cooperators:**

Jeff Witcosky  
Jefferson NF  
Roanoke, VA

Dave Miller  
Univ. of Conn  
Storrs, CT

Dan Twardus  
FHP Morgantown  
Morgantown, WV

Milt Teske  
Continuum Dynamics, Inc.  
Princeton, NJ

**Accomplishments:**

The task was funded by NA and contracted to Continuum Dynamics, Inc. The large database collected by Jeff Witcosky, NA, describes the characteristics of several eastern forest types that are prone to gypsy moth attack. The FSCBG model requires such descriptors to predict spray deposition, canopy penetration, and biological response of efficacy. The database and receptors to access the data will be included in FSCBG 5.0 to be delivered by the contractor in November 1996.

**Funding:**

Source(s):

10,000 NA

Expenditure(s):

10,000 Contract

**Final Product and Completion Date:**

- Database in FSCBG model: November 1996



## **Project I5: SpraySafe Manager—FSCBG Aerial Application Decision Support System**

**Project Leader:** Jack Barry

**Objectives:** To provide land managers with extended FSCBG aerial spray model capability with an easy-to-use biological dose response and decision support system to support safe, efficacious, and economical application of pesticides.

### **Cooperators:**

Brian Richardson and John Ray  
Forest Research Institute  
Rotorua, New Zealand

Harold Thistle  
FHP  
MTDC  
Missoula, MT

Dan Twardus  
FHP  
Morgantown, WV

### **Accomplishments:**

This is a Forest Service joint venture involving the New Zealand Forest Research Institute and its cooperators. The contractor, Continuum Dynamics, Inc., was at the Forest Research Institute (FRI) NZ last November, working with NZ programmers, to develop the code called SpraySafe Manager. The unique feature of this system is the integration of output from FSCBG with biological dose-response models of herbicide/weed and herbicide/sensitive crop combinations. The same logic in this code can be extended to insecticides/insects. This allows users to quantitatively assess the efficacy and environmental fate of herbicides in terms of biological consequences on target and non-target plants. We have plans to extend this technology to insecticides and dose responses they produce via the GypsES DSS. To formalize this cooperative entrepreneurial project, we have drafted an agreement between FRI and FS. FRI legal counsel and FS counsel (Janet Stockhausen) have reviewed the agreement. The revised draft agreement will be delivered to FRI in early November for signature.

### **Funding:**

#### **Source(s):**

50,000	FRI/industry user group
20,000	FHTET

#### **Expenditure(s):**

20,000	Contract
50,000	FRI

### **Final Product and Completion Date:**

- DSS: September 1997

## Focus Area J: Environmental Fate Studies

### Project J1: Dispersion and Fate of *Bacillus thuringiensis* (Bt) in Forested Ecosystems and Canyons

**Project Leader:** Jack Barry

**Objectives:** To (1) evaluate the dispersion and fate of *Bt* in forested mountain terrain; to (2) evaluate FSCBG model in predicting *Bt* drift; to (3) measure *Bt* drift and canopy deposition; and to (4) monitor fate of *Bt* in the forest soil.

**Cooperators:**

John Anhold  
FHP/R-4  
Ogden, UT

Bob Smith  
Abbott Laboratory  
Chicago, IL

Bruce Grim  
U.S. Army  
Dugway, UT

Milt Teske  
CDI  
Princeton, NJ

Harold Thistle  
MTDC  
Missoula, MT

Mark Quilter  
Utah Dept. of Agriculture  
Salt Lake City, UT

**Accomplishments:**

A summary of the Utah gypsy moth drift studies of 1991-93 were reported in FHTET-Davis report FPM 95-18. A paper was presented at the November 1995 International Meeting of the American Society of Environmental Toxicology and Chemistry and is included in abstracts of SETAC. A manuscript has been drafted by Jack Barry and Bob Smith on *Bt* fate in Utah soil. The manuscript will be reviewed by FHP and FIDR and then sent to The Journal of Applied and Environmental Microbiology for publication consideration. Results and findings are in the reports and manuscripts.

There is a FY97 proposal supported by R-4 and the U.S. Army to continue this study. During FY96 I contacted Jack Adams, Bioremediation Laboratory at Weber State University who proposes to conduct this work and to submit a proposal during October 1996.

**Funding:**

Source(s):

2,000 FHTET

Expenditure(s):

2,000 Travel, training, and other

**Final Product and Completion Date:**

- Journal articles: 1997

## **Focus Area K: Biological Controls**

### **Project K1: Population Dynamics - Hemlock Woolly Adelgid**

**Project Leader:** Dick Reardon

**Objectives:** To (1) conduct a life table analysis (population dynamics and life history) of hemlock woolly adelgid (HWA) populations on eastern hemlock in southwestern Virginia; and to (2) develop a model of HWA population dynamics on eastern hemlock in southwestern Virginia.

#### **Cooperators:**

Scott Salom and David Gray  
VPI & SU  
Blacksburg, VA

Brad Onken  
USDA Forest Service  
FHP  
Morgantown, WV

Dennis Souto  
USDA Forest Service  
FHP  
Durham, NH

Rusty Rhea  
USDA Forest Service  
Forest Health  
Asheville, NC

Michael Montgomery  
USDA Forest Service  
NEFES  
Hamden, CT

#### **Accomplishments:**

Completed collection of biology, life history, and population dynamics data for HWA populations and data input into models. Preliminary model runs indicate the need for additional data concerning the effects of temperature and foliage age.

#### **Funding:**

Source(s):  
35,000 FHTET

Expenditure(s):  
35,000 Cooperative Agreement

#### **Final Product and Completion Date:**

- Data incorporated into draft HWA management plan for eastern U.S: March 1997
- Publication in refereed journal: March 1997



## **Project K2: Inventory of Semiochemicals for Forest and Shade Tree Insects in North America**

**Project Leader:** Dick Reardon

**Objectives:** To (1) develop an inventory of semiochemicals of forest and shade tree insects in North America; to (2) assess the status of each semiochemical in regard to uses in forest pest management; and (3) to produce a publication which lists and describes uses for these semiochemicals and suggests priorities for their development.

**Cooperators:**

Wayne Berisford  
University of Georgia  
Athens, GA

**Accomplishments:**

Draft version of publication sent out for technical review concerning format, scope, and technical quality of data. Both hard copy and electronic versions of publication will be available. Publication will be used to prioritize future efforts using semiochemicals for managing forest and shade tree pests.

**Funding:**

Source(s):

no funds provided in FY96  
(all FY95 funds)

Expenditure(s):

none

**Final Product and Completion Date:**

- FHTET publication: December 1996.

## **Project K3: Inventory of Microbials and Nematodes for Control of Forest and Shade Tree Insects in North America**

**Project Leader:** Dick Reardon

**Objective:** To develop an inventory on the potential for the use of microbials and nematodes to manage the major forest and shade tree insect pests in North America.

**Cooperators:**

James Fuxa  
Department of Entomology  
Louisiana State University  
Baton Rouge, LA

**Accomplishments:**

Draft version of publication sent out for technical review. Includes chapter on setting criteria for selecting pests and entomopathogens for microbial control. Publication will be used to prioritize future efforts using microbials and nematodes for managing forest and shade tree pests.

**Funding:**

Source(s):	Expenditure(s):
no funds provided in FY96 (all FY95 funds)	none

**Final Product and Completion Date:**

- FHTET publication: December 1996

## **Project K4: QA/QC Standards for Semiochemicals**

**Project Leader:** Dick Reardon

**Objectives:** To develop and implement a series of QA/QC guidelines for the production and performance of semiochemicals used in monitoring and managing forest and shade tree insects (emphasis on lepidopteran species).

**Cooperators:**

Barbara Leonhardt

USDA-ARS

Insect Chemical Ecology Lab

Beltsville, MD

**Accomplishments:**

List of candidate semiochemicals developed and forwarded to scientists for final selection. Companies that produce semiochemicals for lepidopteran species contacted concerning the need for this cooperation and input into developing QA/QC guidelines.

**Funding:**

Source(s):

30,000 FHTET

Expenditure(s):

30,000 Cooperative Agreement

**Final Product and Completion Date:**

- Set of QA/QC guidelines for semiochemicals that will be used for monitoring and managing lepidopteran species: December 1997



## **Project K5: Biological Control Survey of Noxious Weeds in Forest Ecosystems**

**Project Leader:** Dick Reardon

**Objectives:** To compile information on the current use of biological controls for managing noxious weeds in forest ecosystems in the western U.S.

**Cooperators:**

George Markin  
USDA Forest Service  
Intermountain Forest & Range Experiment Station  
Bozeman, MT

**Accomplishments:**

Data compiled and summarized for previously completed releases and post-release monitoring of natural enemies of noxious weeds in the western U.S. Draft version being edited at technical review.

**Funding:**

Source(s):	Expenditure(s):
10,000 FHTET	10,000 Cooperative Agreement

**Final Product and Completion Date:**

- Electronic database and report summarizing the status of biological control efforts for noxious weeds in forest ecosystems in western United States: December 1996

**Project K6: Develop a pest management program for the pine shoot beetle, *Tomicus piniperda***

**Project Leader:** Dick Reardon

**Objectives:** To coordinate the development of an operational integrated pest management (IPM) program for *Tomicus piniperda*.

**Cooperators:**

Robert Haack	Debbie McCullough	Cliff Sadof
USDA Forest Service	Dept. of Entomology	Dept. of Entomology
NC Forest Experiment Sta.	Michigan State University	Indiana University
E. Lansing, MI	E. Lansing, MI	Lafayette, IN

Vic Mastro	Bill Kaufman
USDA-APHIS	USDA-APHIS
Otis ANG Base, MA	Niles, MI

**Accomplishments:**

Completed second year of data collection to evaluate the use of silvicultural and cultural strategies for management of pine shoot beetle. Initiated laboratory evaluations of alternate host preference for an exotic species of predatory beetle currently in U.S. quarantine and under consideration for release in U.S. Collected first year of data related to interactions involving pine shoot beetle, native bark beetles and native predators in native forest stands.

**Funding:**

Source(s):	Expenditure(s):
41,000 FHTET	33,000 Cooperative Agreement (Michigan State University)
	8,000 Cooperative Agreement (Indiana University)

**Final Product and Completion Date:**

- Compliance program (as an option to quarantine) developed for Christmas tree growers.
- Data concerning use of native bark beetles as hosts by exotic species of predator being reared in quarantine and considered for release in U.S.: October 1997.

## **Project K7: Biological control of *Cylindrocladium* root disease**

**Project Leader:** Dick Reardon/Wu Jian

**Objectives:** To determine the species (strain) of *ectomycorrhizal* (ECM) fungus(i) and its combination with other treatments for suppression of *Cylindrocladium* root disease and for promoting seedling growth.

**Cooperators:**

Peggy Gale	Alan Iskra/Denise Binion
Forestry Dept.	USDA Forest Service - FHP
Michigan Tech Univ.	Morgantown, WV
Houghton, MI	

**Accomplishments:**

Laboratory and nursery experiments are ongoing using several species of *ectomycorrhizal* recovered from nurseries in Pennsylvania.

**Funding:**

Source(s):	Expenditure(s):
10,000 FHTET	10,000 Cooperative Agreement

**Final Product and Completion Date:**

- Identification of *ectomycorrhizal* fungi for suppression of *Cylindrocladium* root disease and for promoting seedling growth: March 1998



## **Project K8: Biological Control of Mile-a-Minute Weed**

**Project Leader:** Dick Reardon

**Objectives:** To coordinate the development of an operational biological control program for Mile-a-Minute Weed.

### **Cooperators:**

Jim Fredericks/Judy Hough-Goldstein  
Dept. Entomology & Applied Ecology  
University of Delaware  
Newark, DE

Phil Tipping  
Maryland Dept. of Agriculture  
Annapolis, MD

Tom Hall  
PA Bureau of Forestry  
Middletown, PA

Scott Kurtzman  
Gladfelter Pulp & Paper Company

Tom Finn  
Virginia Dept. of Agriculture  
& Consumer Services  
Richmond, VA

Ding Jianqing  
Chinese Academy of Agricultural Sciences  
Institute of Biocontrol  
Beijing, People's Republic of China

### **Accomplishments:**

Jim Fredericks accepted a M.S. student at University of Delaware and will assist in developing 3-5 year plan to develop an operational biological control program for mile-a-minute weed. Collections of natural enemies of mile-a-minuteweed continuing in eastern China.

### **Funding:**

Source(s):

45,000 FHTET

Expenditure(s):

40,000 Cooperative Agreements

5,000 ARS

### **Final Product and Completion Date:**

- Operational biological control program for mile-a-minute weed: October 1998

## **Project K9: 4-AA for Southern Pine Beetle**

**Project Leader:** Dick Reardon

**Objectives:** To develop an operational technique to protect individual and small clusters of trees from southern pine beetle (SPB) attacks.

### **Cooperators:**

Jane Hayes/Brian Strom  
USDA Forest Service  
Southern Forest Exp. Sta.  
Pineville, LA

Bobbe Fitzgibbon  
USDA Forest Service  
Forest Health  
Pineville, LA

Stephen Clarke  
USDA Forest Service  
Region 8  
Lufkin, TX

### **Accomplishments:**

The use of 4-AA has proven effective in protecting individual and small clusters of trees from SPB attack. Patent and license agreements have been developed between Mississippi State University and USDA Forest Service. Registration of technical 4-AA is progressing with USDA Forest Service and US-EPA cooperation.

### **Funding:**

Source(s):

35,000 FHTET

Expenditure(s):

35,000 Cooperative Agreements

### **Final Product and Completion Date:**

- Registered and commercially produced operational technique for protection of individual and small clusters of trees from SPB attack: October 1998

## **Project K10: Register Douglas-fir Tussock Moth Pheromone**

**Project Leader:** Dick Reardon

**Objectives:** To obtain registration of the Douglas-fir tussock moth (DFTM) pheromone for use in managing low-density populations.

**Cooperators:**

David Thomas  
Southern Forest Experiment Station  
Forest Health Protection  
Washington, DC

**Accomplishments:**

Registered and commercially produced operational technique for protection of DFTM. There has been no activity on this task.

**Funding:**

Source(s):	Expenditure(s):
none	none

**Final Product and Completion Date:**

- Registered end-use product for managing low-density building DFTM populations: December 1997.

## **Project K11: Optimize NPV Products Registered by USDA Forest Service**

**Project Leader:** Dick Reardon

**Objectives:** To improve application technology and formulations of nucleopolyhedrosis viruses registered by the USDA Forest Service (NPVs: e.g., Gypchek, TM-BioControl-1, and NeocheK-S).

### **Cooperators:**

John Podgwaite  
USDA Forest Service  
NEFES  
Hamden, CT

John Cunningham  
Forestry Canada  
Sault Ste. Marie  
Canada

Kevin Thorpe/Ralph Webb  
USDA ARS  
Beltsville, MD

Bruce Black  
American Cyanamid  
Princeton, NJ

### **Accomplishments:**

Pilot test conducted in Maryland and West Virginia with the gypsy moth nucleopolyhedrosis virus product Gypchek to determine effectiveness of one application (instead of two applications) using a higher dose. Laboratory, spray tower, and airport trials completed in an effort to determine an effective sticker for Gypchek tank mix. Ground application of an *in vivo* produced strain of gypsy moth nucleopolyhedrosis virus.

### **Funding:**

Source(s):

10,000 FHTET

Expenditure(s):

10,000 Cooperative Agreement

### **Final Product and Completion Date:**

- Operationally usable formulations of all nucleopolyhedrosis viruses registered by USDA Forest Service: December 1998.



## **Project K12: Biological control of Cypress aphid in Kenya**

**Project Leader:** Dick Reardon

**Objectives:** To (1) locate, collect, and rear parasites and invertebrate predators of the cypress aphid from populations in North America, Mexico, India and Pakistan and to (2) ship these parasites and invertebrate predators to a quarantine facility in England for eventual release in Kenya.

### **Cooperators:**

Dan Kucera  
USDA Forest Service-NA, FHP  
Radnor, PA

Denny Ward  
USDA Forest Service, R-8, FHP  
Atlanta, GA

Sean Murphy  
IIBC  
Silwood, England

Joseph Mwangi  
Forest Health Management Center  
Kenya

### **Accomplishments:**

Survey for parasites and predators in native habitats of the Cypress aphid continues.

### **Funding:**

Source(s):  
10,000 NA

Expenditure(s):  
10,000 Travel, training, and other

### **Final Product and Completion Date:**

- Establishment of an effective natural enemy complex for Cypress aphid in Kenya: December 1997.

## **Project K13: Cooperative Biological Control Efforts - ARS, APHIS, IIBC**

**Project Leader:** Dick Reardon

**Objectives:** To (1) expedite the development and use of biological control agents to manage forest and urban pests and to (2) survey for parasites and predators in native habitats.

### **Cooperators:**

Roger Fuester/Paul Schaefer  
USDA-ARS  
Newark, DE

Ernest Delfosse  
USDA-APHIS  
Riverdale, MD

Sean Murphy  
IIBC  
Silwood, England

### **Accomplishments:**

Gypsy moth larvae parasitized by the braconid parasite *Rogas indiscretus* collected in India. Adult and pupal stages of *R. indiscretus* shipped to ARS quarantine in Newark, DE for production of large numbers for release at several sites within the U.S. in 1997.

### **Funding:**

Source(s):

5,000 FHTET  
8,000 ARS

Expenditure(s):

13,000 Travel, training, and other

### **Final Product and Completion Date:**

- Release of *Rogas indiscretus* for establishment against gypsy moth populations in Lake States and eastern U.S.: Ongoing.

**Project K14: Biological control of mealybug, *Oracella acuta*, in the People's Republic of China**

**Project Leader:** Dick Reardon

**Objectives:** To (1) establish and/or identify dense populations of *Oracella acuta* in pine plantations in Georgia in order to collect natural enemies; to (2) identify the major parasitoids and predators that may be used in a classical biological control program in the People's Republic of China (PRC); and to (3) arrange to collect and ship natural enemies to the PRC for establishment in quarantine and eventual release into the field.

**Cooperators:**

Wayne Berisford  
Dept. of Entomology  
University of Georgia  
Athens, GA

Gary DeBarr  
USDA Forest Service  
Southern Forest Exp. Sta.  
Athens, GA

Wu Jian  
Chinese Academy  
of Forestry  
Beijing, China

**Accomplishments:**

Research team from U.S. visited People's Republic of China to examine rearing facility and to assist in developing techniques for rearing parasites. Shipments of parasites from U.S. to People's Republic of China are continuing.

**Funding:**

Source(s):  
45,000 FHTET

Expenditure(s):  
45,000 Cooperative Agreement

**Final Product and Completion Date:**

- Establishment of parasites of the mealybug in People's Republic of China: December 1998.

## **Project K15: Biological control of Woodwasp, *Sirex noctilio*, in South America**

**Project Leader:** Dick Reardon

**Objectives:** To (1) coordinate the development of a biological control program for *Sirex noctilio* including the establishment of a natural enemy complex for minimizing damage caused by this pest species; and to (2) provide training to Forest Service personnel in biological control and monitoring techniques for *S. noctilio*.

**Cooperators:**

Sean Murphy	Edson Tadeu Iede/Erich Schaitza
IIBC	CNP Florestas/EMBRAPA
Silwood, England	Curitiba, BRAZIL

**Accomplishments:**

Parasite *Megarhyssa nortoni* collected in Australia and shipped to a quarantine and rearing facility in Curitiba, Brazil. Parasite being reared in large numbers for release in 1997.

**Funding:**

Source(s):	Expenditure(s):
12,000 FHTET	12,000 Travel, training, and other

**Final Product and Completion Date:**

- Establishment of parasites for control of *Sirex noctilio* in Brazil. Transfer for biological control technology to other South American and African countries infested with *Sirex noctilio*: December 1997.



## **Project K16: Biological Control of Hemlock Woolly Adelgid**

**Project Leader:** Dick Reardon

**Objectives:** To (1) develop methods for rearing predators of hemlock woolly adelgid (HWA) for eventual release; to (2) design standard protocols to sample HWA and predator populations; to (3) release, determine the effectiveness of, and to establish natural enemies of HWA, and to (4) develop an effective biological control program for HWA.

### **Cooperators:**

Mark McClure/Carole Cheah  
Connecticut Agr. Exp. Sta.  
Hartford, CT

Dennis Souto  
USDA Forest Service, FHP  
Durham, NH

Brad Onken  
USDA Forest Service, FHP  
Morgantown, WV

Rusty Rhea  
USDA Forest Service, FH  
Asheville, NC

Michael Montgomery/Kathy Shields  
USDA Forest Service  
Northeast Forest Exp. Sta.  
Hamden, CT

### **Accomplishments:**

Over 7,000 adults of a predaceous beetle have been released in adelgid-infested hemlock forests in Connecticut. This predator has been recovered in several sites in Connecticut. Rearing of the beetle in the laboratory continues for release efforts in 1997.

### **Funding:**

Source(s):

75,000 FHTET

Expenditure(s):

75,000 Cooperative Agreement

### **Final Product and Completion Date:**

- Establishment of invertebrate predators of HWA in eastern U.S.: October 1998.

## **Project K18: Silvicultural Prescriptions for Managing Gypsy Moth Populations**

**Project Leader:** Dick Reardon

**Objectives:** To determine the relative efficacy of selected silvicultural and insecticide options for managing gypsy moth impacts to forest stands.

### **Cooperators:**

Russ MacFarlane  
George Washington National Forest  
Natural Bridge Station, VA

Jeff Witcosky  
USDA Forest Service-FH  
Asheville, NC

Kurt Gottschalk  
USDA Forest Service-NEFES  
Morgantown, WV

### **Accomplishments:**

Plots were monitored for estimates of gypsy moth density, tree growth and vigor. Gypsy moth populations are not increasing in the general area but declining due to incidence of fungus *Entomophaga maimaiga*.

### **Funding:**

Source(s):

8,100 FHTET  
8,000 R-8

Expenditure(s):

16,100 Travel, training, and other

### **Final Product and Completion Date:**

- Relative efficacy of silvicultural and insecticide options for specific habitats and gypsy moth populations: December 1997.

## **Project K19: Develop Semiochemicals for Operational Use**

**Project Leader:** Dick Reardon

**Objectives:** To evaluate modified application equipment and tank mixes for the flake (Hercon) and bead (Biosys) formulations of disparlure.

### **Cooperators:**

Barbara Leonhardt  
USDA-ARS  
Insect Chemical Ecology Lab  
Beltsville, MD

Vic Mastro/Win McLane  
USDA-APHIS  
Otis ANG Base, MA

Donna Leonard  
USDA Forest Service-FH  
Asheville, NC

Steve Talley  
Rockbridge County Gypsy Moth Coordinator  
Staunton, VA

### **Accomplishments:**

Flakes were applied using originally developed equipment for Hercon and modified by Harold's Flying Service as well as by USDA-APHIS Aircraft Operations. Andy Trent (METC, Missoula, MT) visited several operational sites in an effort to evaluate the currently used application equipment. Numerous tank mixes containing beads were evaluated for deposition pattern and adhesion to foliage.

### **Funding:**

Source(s):

40,000	FHTET
15,000	R-8, FHP

Expenditure(s):

55,000	Cooperative Agreement
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### **Final Product and Completion Date:**

- Operationally usable pheromone products for managing low density expanding populations of gypsy moth: December 1997.

## **Project K20: Swath kit: Support for Cooperative Suppression and Eradication Programs**

**Project Leader:** Dick Reardon

**Objectives:** To (1) provide on-line technical assistance concerning the maintenance and upgrades of hardware/software for Swath Kits; to (2) upgrade the hardware in existing Swath Kits to enable the Windows operating system to be run and to give instruction on the new Windows version of the Swath Kit; to (3) continue to publish the Swath Kit Newsletter, a biannual information newsletter giving news, advice, and technical bulletins on the subject; and to 4) construct an Internet WWW site as a repository of information on the Swath Kit.

**Cooperators:**

Steve Maczuga  
Dept. of Entomology  
Pennsylvania State University  
University Park, PA

**Accomplishments:**

Technical assistance was provided to swath kit users. All hardware for Swath Kits upgraded for Windows operating system, with Windows version evaluated several times, but not ready for distribution to users. Two issues of Swath Kit Newsletter were published. A WWW site was established.

**Funding:**

Source(s):

34,000 NA-FHP

Expenditure(s):

34,000 Cooperative Agreement

**Final Product and Completion Date:**

- Completion of software and hardware upgrades for Swath Kits as well as training for Windows operating system: December 1996.



## **Project K21: Develop Biological Controls for Suppression of Root Disease on Conifers in Nurseries**

**Project Leader:** Dick Reardon/Wu Jian

**Objectives:** To coordinate the development of operational biological controls for suppression of root diseases on conifers in nurseries.

**Cooperators:**

Cindy Ocamb  
US Forest Service  
NC Forest Exp. Sta.  
Minneapolis, MN

**Accomplishments:**

Greenhouse and laboratory preliminary screenings of *ectomycorrhizal* fungi collected in several states for impacts on Fusarium root rot on white and red pine seedlings ongoing.

**Funding:**

Source(s):	Expenditure(s):
5,000 FHTET	5,000 Travel training, and other

**Final Product and Completion Date:**

- Identification of *ectomycorrhizal* for field trials and eventual biocontrol of Fusarium root rot: March 1998

## **Project K22: Analysis and Environmental Fate of Insecticides Used to Control Forest Defoliators**

**Project Leader:** Dick Reardon

**Objectives:** To (1) develop a method for the extraction and HPLC/electrospray/mass spectrometric analysis of tebufenozide (RH-5992, the active component of MIMIC) from environmental samples and to (2) study the persistence of MIMIC on tree foliage, in underlying ground litter, and in soil in Ohio and West Virginia forests throughout a growing season and post leaf-fall.

### **Cooperators:**

Mary J. Wimmer  
Dept. of Biochemistry  
West Virginia University  
Morgantown, WV

John Long  
Rohm and Haas Co.  
Philadelphia, PA

### **Accomplishments:**

All field samples from plots in Ohio and West Virginia processed and stored in a freezer. Preliminary efforts on-going to identify the most efficient technique for analyzing for tebufenozide from environmental samples.

### **Funding:**

Source(s):

30,000 FHTET

Expenditure(s):

30,000 Cooperative Agreement

### **Final Product and Completion Date:**

- Residue profiles for tebufenozide in broadleaved forests: October 1997.

**Project K23: Previously released natural enemies of selected pests in North America: utilization of alternate hosts**

**Project Leader:** Dick Reardon

**Objectives:** To (1) selection of pest projects involving natural enemies for analysis; to (2) compile the pre- and post-release literature for these pest projects; to (3) conduct a field assessment of actual host ranges of the natural enemies released for these pest species; and (4) to assess population consequences of attacks to pests and other hosts.

**Cooperators:**

Roy Van Driesche/Joe Elkinton  
Dept. of Entomology  
University of Massachusetts  
Amherst, MA

**Accomplishments:**

A Ph.D student was selected as principal investigator. Study plan completed including the selection of a "prototype" pest species and preliminary identification of study sites for assessment of host ranges.

**Funding:**

Source(s):	Expenditure(s):
no funds provided in FY96	none
(FY95 funds only)	

**Final Product and Completion Date:**

- Protocols for selection and host testing of exotic species of natural enemies for release in North America: July 1999

**NOTE:** K24 is not listed in the Plan of Work FY96 and is an additional task

## **Project K24: Dyer's Woad Control Demonstration**

**Project Leader:** Jack Barry

**Objectives:** To demonstrate the feasibility of controlling large-area infestations of the exotic weed dyer's woad by aerial application of a native fungus (*Isatis tinctoria*) known to infect this weed.

### **Cooperators:**

Sherm Thomson and Brian Kropp	Dave Baumgartner	Jed Dewey
Utah State University	FHP/R-4	FHP/R-1
Ogden, UT	Ogden, UT	Missoula, MT

Utah Department of Transportation  
Salt Lake City, UT

Utah Department of Agriculture  
Salt Lake City, UT

### **Accomplishments:**

This project was initiated in 1996 as a special opportunity. This began with a meeting in Salt Lake city in April called by Dave Baumgartner, Sherm Thomson, and Jack Barry. It was clearly demonstrated at this meeting that the rust had significant potential of controlling dyer's woad; therefore I agreed to fund development of a rust inoculum for application by helicopter.

The project studied the infection process and how the fungus surfaces in the plant, with some results demonstrating how and when to inoculate woad. A GPS receiver was purchased at Utah State University to use for locating and documenting dyer's woad and woad rust sites, with the goal to monitor the spread and population density of both organisms. An inoculation sites survey was conducted, with results recorded as the incidence and vigor of woad. Several other studies essential to conducting the field demonstration were initiated in 1996, including: (1) Production of basidiospores *in vivo*, (2) Preparation of dyer's woad rust inoculum, (3) Inoculum drying temperature vs. viability, (4) Long-term storage temperature vs. viability, and (5) Inoculum texture vs. viability.

### **Funding:**

Sources:	Expenditures:
50,000 FHTET	178,000 Cooperative Agreements
30,000 Utah State University	
18,000 Utah Department of Transportation	
20,000 Utah Department of Agriculture	
60,000 USDA-CSREES	

### **Final Product and Completion Date:**

- Full capability to apply fungus to control Dyer's woad by aerial application: on or before December 2001
- Field trials and demonstration to begin Spring 1997



## Focus Area L: Nontarget Studies

### **Project L1: Nontarget impacts monitoring associated with gypsy moth suppression**

**Project Leader:** Dick Reardon

**Objectives:** To determine the potential long-term impacts of selected insecticides and defoliation on selected nontarget terrestrial arthropods, salamanders, and birds associated with broadleaved forests.

#### **Cooperators:**

Linda Butler  
Dept. of Forestry  
West Virginia University  
Morgantown, WV

Robert Cooper  
Memphis State Univ.  
Memphis, TN  
Elkins, WV

Gary Bustamente  
USDA Forest Service  
Monongahela National For.

Jeff Witcosky  
USDA Forest Service, FH  
Asheville, NC

#### **Accomplishments:**

Before treatment monitoring continues for selected species of terrestrial arthropods, salamanders, and birds associated with broadleaved forests. Arthropod studies are focusing on monitoring of over 400 species of macrolepidopterous, over 110 species of caterpillars, over 100 species of spiders, over 50 species of carabids and numerous other taxa. Bird studies have emphasized evaluation of abundance and nest productivity of five species of songbirds. Salamander studies are evaluating abundance and physiological condition of four major species. Parameters of all animal taxa are being related to vegetational characteristics of study plots. Treatments are planned for 1997.

#### **Funding:**

Source(s):	Expenditure(s):
110,000 FHTET	110,000 Cooperative Agreement

#### **Final Product and Completion Date:**

- Protocols for Federal and State cooperative gypsy moth suppression and eradication programs: December 1999.

## **Project L2: Nontarget impacts monitoring associated with eradication of Asian strain of gypsy moth in southeastern North Carolina**

**Project Leader:** Dick Reardon

**Objectives:** To (1) quantify nontarget impacts on Lepidoptera from the application of *Bacillus thuringiensis* (*Bt*) and Gypchek in southeastern North Carolina and (2) to develop a checklist of Lepidoptera species from southeastern North Carolina that are found in unique habitats and habitats of special concern.

### **Cooperators:**

J. Bolling Sullivan  
Consultant  
Beaufort, NC

Steve Hall  
North Carolina Nature Conservancy  
Raleigh, NC

Lloyd Garcia  
NC Dept. of Agriculture  
Raleigh, NC

Donna Leonard  
USDA Forest Service, FH  
Asheville, NC

### **Accomplishments:**

Collection of nontarget lepidopteran species completed from *Bt* and Gypchek treated and untreated study plots. Identification of collected specimens to species level completed. Data entry and analyses on-going.

### **Funding:**

Source(s):

32,300

FHTET

Expenditure(s):

32,300

Contract

### **Final Product and Completion Date:**

- Guidelines for aerial application of *Bt* for eradication of gypsy moth populations: December 1996.

### **Project L3: Guidelines for quantifying nontarget effects on Lepidoptera in forest ecosystems**

**Project Leader:** Dick Reardon

**Objectives:** To establish a set of monitoring guidelines which would be implemented as a minimum for all evaluations to determine impacts on non-target species of Lepidoptera in forested ecosystems.

**Cooperators:**

Jeff Miller  
Dept. of Entomology  
Oregon State Univ.  
Corvallis, OR

David Wagner  
Dept. of Evolutionary Biology  
University of Connecticut  
Storrs, CT

**Accomplishments:**

Draft version of handbook completed and sent out for technical review.

**Funding:**

Source(s):	Expenditure(s):
10,000 FHTET	10,000 Cooperative Agreement

**Final Product and Completion Date:**

- Protocols for quantifying non-target effects on Lepidoptera in forested ecosystems: December 1996.

**Project L4: Develop a database concerning impacts of biopesticides to nontargets in forest ecosystems**

**Project Leader:** Dick Reardon

**Objectives:** To develop and maintain an electronically accessible database on the documented nontarget impacts of biological insecticides when applied to forest ecosystems.

**Cooperators:**

Steve Holmes	David Behmer
Canadian Forest Service	Lake Superior State University
Sault Ste. Marie, Ontario	Sault Ste. Marie, MI
Canada	

**Accomplishments:**

A draft database has been completed and sent to scientists for review.

**Funding:**

Source(s):	Expenditure(s):
20,000 FHTET	17,000 Cooperative Agreement (Lake Superior State University)
	3,000 Cooperative Agreement (Canadian Forest Service)

**Final Product and Completion Date:**

- Electronic and hard copy database on nontarget impacts: October 1996



**NOTE:** Project L5 is not in the Plan of Work for FY96 and should be considered an additional task

**Project L5: Develop handbooks of common caterpillars of western and eastern forests**

**Project Leader:** Dick Reardon

**Objectives:** To develop handbooks of common caterpillars of western and eastern forests to provide to land managers

**Cooperators:**

Jeff Miller  
Dept. of Entomology  
Oregon State University

David Wagner  
Dept. of Evolutionary Biology  
University of Connecticut  
Storrs, CT

**Accomplishments:**

Handbook on western caterpillars species completed, printed and distributed (FHM-NC-06-95). Draft version of handbook of eastern caterpillar species (approximately 200 species) completed and forwarded for technical review.

**Funding:**

Source(s):  
16,000 FHTET

Expenditure(s):  
16,000 Cooperative Agreement

**Final Product and Completion Date:**

- Handbooks of caterpillars of western and eastern forests: December 1996

## APPENDIX A: ACRONYMS AND ABBREVIATIONS

CABI	Center for Agriculture and Business, Inc.
DFTM	Douglas-Fir Tussock Moth
DSS	Decision Support System
EPA	Environmental Protection Agency
FHP	Forest Health Protection
FHTET	Forest Health Technology Enterprise Team
FRI	Forest Research Institute
FS	Forest Service
FTP	File Transfer Protocol
GIS	Geographic Information Systems
FMSC	Forest Management Service Center
FSCBG	Forest Service Cramer-Barry-Grim aerial spray model
IIBC	International Institute of Biological Control
MTDC	Missoula Technology Development Center (MTDC)
NA	Northeastern Area
NAPIAP	National Agricultural Pesticide Impact Assessment Program
NBS	National Biological Survey
NC	Northcentral Forest Experiment Station
NE	Northeast Forest Experiment Station
NF	National Forest
NRIS	National Resource Information Systems
NWS	National Weather Service
PNW	Pacific Northwest Forest and Range Experiment Station
POW	Program of Work
PTIPS	Pest Trend Impact Plot System
RSAC	Remote Sensing Applications Center
TDP	Technology Development Program
WO	Washington Office
WWPB	West Wide Pine Beetle
WFHI	Western Forest Health Initiative
WWW	World Wide Web

## APPENDIX B: PUBLICATIONS

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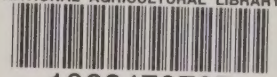
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